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COMMITTEE ON EDUCATIONAL RESEARCH
The University of Alberta

Editorial Comment

This issue of the *Alberta Journal of Educational Research* takes us into the fourteenth year of publication. Readers of long-standing will be aware that the basic concerns of researchers and consumers of research have not changed radically over the years. Writers still concern themselves with the philosophical implications of the choices facing our public schools as technological developments have impact on our society. They are concerned with the validity of our measurement of important attributes and with the soundness of our theoretical assumptions. They report evidence painstakingly gathered to cast light on problems old and new, and they remind us that occasionally we must withdraw from the battle lines to reassess our direction and our methods.

Anderson pleads with educators to begin immediately to study the educational choices made necessary by recent changes in technology and industry. He states that if educators abdicate the responsibility of decision-making they deny themselves the privilege of guiding the choices along philosophically acceptable paths.

In his article, MacKay illustrates the increased efficiency which can result if the scientific approach used in research is applied to the management of that research! Through systematic identification and analysis of the tasks that are critical to the progress of the research, time and money can be invested to greatest advantage.

Sawada concerns himself with the development of a method for assessing "conservation of length" that will result in a relatively pure measure, one virtually independent of verbal abilities. His procedures and reasoning are carefully described so that the reader may judge the applicability of his procedures to other situations. If the investigator considers verbal involvement to be an integral part of a measure of conservation, he will, of course, want a measure that reflects that interrelationship.

Three articles report and analyze data collected in surveys. Rattan and MacArthur present a segment of a longitudinal project that has been reported periodically in the *Alberta Journal of Educational Research*. Their focus is the utility of various culture-oriented and culture-reduced measures of intelligence and achievement in longitudinal prediction for Indian, Eskimo and Metis children. Anant has gathered evidence about the value of two aptitude tests in predicting high school achievement in English and Mathematics. He compares the Differential Aptitude Tests and the Primary Mental Abilities on their predictive validity and efficiency. The relationships between some personality measures and academic achievement are explored in Linton's article. The study he

reports was done with a population of junior high school students from Western Canada.

Greenfield offers a synthesis of leadership research that is not otherwise available. He states the case for a broader conceptualization of leadership which in turn implies a greater concern for theory and for the adequacy of research design. Readers, other than those involved in leadership research, should find that many of the generalizations made by Greenfield also apply to other fields of research.

The statement about preparation of manuscripts, which appears on the inside back cover, indicates a change in editorial policy. The official manual of style has been changed from the *MLA Style Sheet* to the *Publication Manual of the American Psychological Association, 1967 Revision*. The one exception to APA style is that the *Oxford English Dictionary* will continue to be the guide for spelling.

P.A.L.

Two factors which will influence what goes on in schools—technology and the contemporary industrial state—are discussed. The unpleasant consequences of the merging of these influences are depicted and a new remedy suggested.

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Galbraith, Technology, and Education *

There are two increasingly formidable influences on contemporary education. The first is clearly technology;¹ the second, less apparent but probably more profound, is the extent to which the large corporations are controlling the behaviour and beliefs of everyone, especially those of the very young. On this second topic Galbraith² has written a rambling, redundant and provocative book which will be considered first.**

Current large corporations such as General Motors, Westinghouse, General Dynamics, Ford, Raytheon, and so forth, have come increasingly to use technology, the "... systematic application of scientific or other organized knowledge to practical tasks" (p. 12). This application is possible only if the task, say the construction of an automobile, is broken into subdivisions, each of which is coterminous with some established area of organized knowledge, such as metallurgy, mechanical engineering or inorganic chemistry (p. 12). Some main consequences include the following: the span of time between the initiation and completion of the task increases, specialized experts for each portion of the task must be hired and their work coordinated, the task cannot seriously be changed or the knowledge and equipment related to specialized parts of the task become useless (pp. 13-15), and the necessary commitment of time and capital requires the use of planning and the reciprocal sus-

*The present manuscript was written before the writer became aware of Michael Harrington's "The Social-Industrial Complex", *Harper's*, November, 1967, pp. 55-60, which has the same orientation.

**Page numbers for subsequent references to the Galbraith book will be shown in parentheses following the citation.

pension of the market economy which is dangerously unreliable (pp. 23-26). Only large corporations can carry out such planning (pp. 32-33, p. 74), defined as the ability to organize and employ information, more specifically to foresee and blueprint the actions required between the initiation of a production task and its completion, and to have ready solutions to unscheduled problems which may arise.

This planning must be carried out by a technostructure, a hierarchy of men who bring relevant technical knowledge and experience to group decision-making (p. 59) and who now direct the enterprise in place of the entrepreneur (pp. 89-91). Certain attributes of this technostructural management are worth considering. In the first place, it is "... an apparatus for ... pooling and testing the information provided by numerous individuals to reach decisions that are beyond the knowledge of any one" (p. 77). In this complex and specialized world, no one individual can be relied on to make decisions.

Forthright and determined administrators frequently react to belief in the superior capacity of individuals for decision by abolishing all committees. They then constitute working parties, task forces, assault teams, or executive groups in order to avoid the one truly disastrous consequence of their action which would be that they should make the decision themselves (p. 65).

The decisions of the technostructure cannot be arbitrarily or capriciously overruled by the intervention of any one individual (pp. 69-70). This is true even of the titular heads of organization, whose main power resides not in their contribution to decision-making but in their choice of the members of groups who make decisions (p. 70).

Secondly, what are the goals that inform the decisions of these men? The first is the preservation of its autonomy by the amassing of capital from earnings (p. 168). Failure to do so would require an appeal to outside sources of capital, an event which would certainly abridge technostructural autonomy, and possibly even necessitate a reckoning with stockholders who are normally about as powerless to influence corporate decisions as the citizens of any community are to change what goes on in schools. Evidence that this autonomy is an important social value can be seen in the restriction of governmental attempts to regulate any industrial enterprise which is inimical to life and limb (pp. 169-170), the imperfect labellings of cigarettes and the failure to restrict the sale of arms being obvious examples. This goal of maintaining a high level of earnings involves the minimizing of risk-taking because prevention of loss is more important than maximum earnings (p. 169), a situation which makes trouble for McClelland's conception³ now apparently dated, that entrepreneurship involves just such risk-taking.

In order to secure this primary goal of a "... secure level of earnings and a maximum rate of growth consistent with the provision of reserves for the requisite investment ..." (p. 176), the control of the technostruc-

ture must embrace not merely labour and raw materials but also the desires and the aggregate demand of the consumer (p. 200). Consumer demand managed in this way must not be restricted to goods relating to the physical needs of the individual; new and hitherto unknown "psychological needs" must be implanted in the individual by mass advertising. Sales efforts are designed to "... shift the locus of decision in the purchase of goods from the consumer where it is beyond control to the firm where it is subject to control" (p. 205). If sales are slipping, corporations can usually find means "... to keep exercise of consumer discretion within workable limits" (p. 207).

However, this mass persuasion cannot be expected to deal in subterranean goals which may be at odds with those emphasized by other more obviously attractive, socializing agencies. Accordingly, the direct (professional) and indirect (nonprofessional) advertising efforts of the large corporation are governed by a principle of congruity, which refers to the situation in which the goals of society and the corporation accurately reflect those of the technostructure (p. 161). In Galbraith's words:

Much of what is believed to be socially important is . . . the adaptation of social attitudes to the goal system of the technostructure. . . . These social goals, though in fact derived from the goals of the technostructure, are believed to have original social purpose (p. 163).

For example, the keeping of aggregate demand reliably high is greatly helped by a large military expenditure by the government, a situation promoting the introduction of advanced technology which would "... otherwise be excluded by cost and risk" (p. 229). As Galbraith remarks, "That weaponry in the higher megaton ranges of destructive power has an organic relation to the performance of the economic system leads to unpleasant speculation" (p. 230). However, the extent and effect of this speculation are diminished if the claim is established that the weapons are being manufactured in defense of freedom and not primarily to swell corporation coffers (p. 162). Another important and insidious claim is that the product being manufactured contributes to a high material standard of living (p. 164).

Reviewers of Galbraith's book have largely ignored its significance for professional educators, i.e., the enormous amount of dissonance which this corporate enterprise must create and occasionally attempt to gloss over. Very distressing is the emphasis on consumption of specific and general material products, even though these are more abundant than ever before.

Morally, we agree that the supply of goods is not a measure of human achievement; in fact, we take for granted that it will be so regarded. . . . Advertising and its related arts thus help develop the kind of man the goals of the industrial system require—one that reliably spends his income and works reliably because he is always in need of more (pp. 209-210).

Another source of dissonance to the wary must come from the deliberate attempt by the technostructure to bamboozle professional experts and the public. For example, Galbraith replaces the Accepted Sequence or flow of instruction from consumer to market to producer by the Revised Sequence, which refers to the situation in which "... the producing firm reaches forward to control its markets and on beyond to manage the market behavior and shape the social attitudes of those ... that it serves" (p. 212). The Accepted Sequence has the big advantage of supposedly ministering to the needs of the individual and partakes of the nature of revealed truth to many. As such it serves as a cloak for the power of the technostructure, even to the extent of sanctioning air and stream pollution, cigarette advertising and industrial squalor generally (p. 217). Imagery has to be continued to maintain the erroneous picture of the corporation's fight for "individual freedom" against the power of government when, in fact, the corporation, often largely and sometimes completely (p. 393) dependent on government contracts, is concerned with advancing its own authority at the expense of the individual.

The second increasing influence on education, technological development, has three connections with Galbraith. Firstly, some of the corporations which are in the defense business have entered the educational market by taking over publishing firms. For example, Raytheon has taken over D. C. Heath and R. C. A. has acquired Random House.⁴ The possibility is great, then, that future decisions affecting the curriculum will not be taken by professional educators. Silberman⁵ quotes a superintendent as saying that "... the center of gravity for educational change is moving from the teacher's college and the superintendent's office to the corporation executive suite." Secondly, the corporation and the school systems generate groups which are characterized by "decision centrality", a situation in which the members of the group search out and transmit factual information to the leader who makes the decision.⁶ Because an economical search of this kind must inevitably be carried out by specialists, this situation will eventually resemble Von Bertalanffy's⁷ state of "progressive mechanism" in which greater efficiency is attained by having specialized parts the functions of which, however, are not interchangeable. Technological innovations will cause this state, already in evidence with the trend towards specialists and consultants in schools, increasingly to characterize school organization.⁸

What role will the teacher play when, under the euphemistically-labelled computer-assisted (CAI) instruction, he is free from the necessity of supervising rote learning and drill? One of Silberman's answers, that the teacher will do what "... only the human being can do, playing the role of catalyst in group discussions ..." is far from reassuring in that he does not specify what these discussions will be about. Springer¹⁰

suggests that all personnel under "computerized education" will gain valuable time for the more "... creative and substantive aspects of their work", but does not specify exactly what "creative" and "substantive" mean. A third answer begins with an accurate comment by McMurrin¹¹ to the effect that in schools there is a great neglect of "the inner-life", i.e., "... the esthetic pleasures ... that accrue from sharpening the instruments of sensory perception, or the intrinsic values in the appreciation of poetry and art which are available to those whose education has cultivated their intuitive powers and refined their capacities for sympathy and feeling". Perhaps this instructional (custodial) function, probably the most intractable as far as computerization is concerned, is to be left to the software.

This would be unfortunate for it is here that instruction is at its weakest. Writing from this stance, Friedenberg¹² claims that the school is a means for bringing the individual into line with the rules and behaviour generally regarded as socially desirable by most socializing agencies in any group. Administrators and teachers are specialists in controlling students, and especially dissidents and critics who are not responsive to these rules and behaviour. The general technique for bringing this about is to reinforce the young person's sense of humility and weakness in the face of authority,¹³ a task made easier by stressing that accommodative behaviour is a prerequisite for further education and economic advancement.

All sorts of accommodative behaviour are valued by the school; social adroitness,¹⁴ a reliance on external criteria for judging people,¹⁵ a willingness to get along without making trouble for established authority which is, after all, only trying to do its job¹⁶ and a rejection of discrimination which reflects private standards of what is valuable.¹⁷ There is a corresponding distaste for solitary people who pay attention to private feelings and intellectual concerns¹⁸ and who may exhibit, accordingly, unusual and spontaneous responses which are intolerably idiosyncratic.¹⁹ Unfortunately, the study of the fine arts and literature tends to promote just such a subjectivity and individuality. Youngsters who have independent access to these sources of knowledge and experience:

... retain both a standard against which to judge the pattern of values the school conveys and a source of self-esteem beyond its control. But these ... would also constitute a threat to the mass society if they were allowed to mature. The function of the school, in socializing them, then, is to deprive them of access to that source of self-esteem and to shape their confidence in the standard from which it is derived.²⁰

Two remedies are available for this unfortunate state of affairs and for any outbreaks of subjectivity which may or may not be associated with it. The first is to arrange for these subjects to be treated in an authoritative manner by teachers who are quite incapable of having esthetic experience or responding to its communication by others.²¹ Special

competence and unique appreciation in this area are to be discredited before the authoritative interpretation of the teacher which ignores alternatives. The second remedy is to rely on the school psychologist to give the same treatment to "the inner-life". This function is to "straighten out" these misguided individuals, a disproportionately larger number of whom come from relatively wealthy homes²² or are Negroes,²³ by pointing out the present and future advantages of their accommodating themselves to the requirements of the school.²⁴ Some such custodial function will doubtless be the lot of the future teacher who will be trained as a so-called "psychologist".

Now this sort of schooling is at one with the corporation in discounting the importance of individual decision-making under the guise of protecting his "freedom". Accordingly, the public-relations strategy of both school and corporation must involve the support of high-level "sacred" values which involve no necessary reference to its own business or professional practices and no commitment to any side in current issues. MacIntyre has pointed out, in a different context, that we have specific moral problems like divorce or wars or premarital intercourse and, at the same time:

. . . a set of exceptionally high-minded, but extremely general moral principles. The difficulty is that we do not know how to connect the principles and the problems. How does one apply such beliefs as that one ought to alleviate suffering or uphold the dignity of the individual to the concrete problems of nuclear weapons or free love? . . . With sufficient ingenuity you can enlist them in support of any and every solution to any and every problem.²⁵

This allows a verbal commitment to peace (on earth, good will to men) to sit with a vested interest in the continuance of military spending, in the Cold War and in the beliefs and values consonant with it (pp. 327-333).

If Friedenberg's approach is correct—and certainly teachers' behaviour tends to be of an accommodative sort²⁶—a difficult time lies ahead for any group of youngsters who respond to this dissonance by using some of the countermeasures suggested by Galbraith (pp. 345-346), the sceptical scrutiny of official pronouncements^{27,28,29,30} and the concentration on nonmaterial social and esthetic values. And yet, if Galbraith is correct, these individuals are the only barrier to a 1984 arranged by corporations and condoned by governments. "The danger to liberty lies in the subordination of belief to the needs of the industrial system. In this the state and the industrial system will be partners" (p. 398). Allowing youngsters to drift into obviously deviant groups which can be pejoratively labelled³¹ would be a mark of despair. Conceptual systems theory, as recently advocated by Schroder, Driver, and Streufert³² may have something constructive to offer.

Schroder, Driver and Streufert³³ distinguish between "content" variables which refer to the dimensions of what a person knows, and "structural" variables, which refer to the number of dimensions along which stimuli are ordered, the number of different "schemata" for organizing dimensions—conjunctive, disjunctive, reciprocal and so forth—and any complexity of that organization. Individuals at a low level of conceptual structure operate in a relatively inflexible way: they use a few compartmentalized dimensions which are coordinated in hierarchical fashion in only one way.³⁴ Furthermore, as far as conceptual functioning is concerned, stimuli, which are interpreted in terms of one or the other of the dimensions, are distributed dichotomously along the dimension chosen, and new recalcitrant stimuli are either distorted to fit existing dimensions or are gated out.³⁵ The overt behaviour associated with this simple structure include categorical or black-white judgement,³⁶ relatively fast decisions in conflict or choice situations because there are few alternatives,³⁷ and maximal control of behaviour by the stimulus situation. Such an individual is at the mercy of the stimulus, easy game for the advertising agencies.

The customer . . . must be taught, trained, drilled. By creating is meant the creation of new standards of wants, new appetites, new desires; new dislikes; new standards of taste and propriety; a new environment, physical as well as mental, of work, as well as play.³⁸

By contrast, the complex structure, characterized by an increase in the number of dimensions and in the complexity of their coordination, is adaptive in a more flexible way. For example, referring a stimulus to more than one dimension, it exhibits more fine discrimination among stimuli within dimensions, and generates new dimensions and ways in which they can be coordinated so that there is an easy coping with situational change over time or a replacement of a maladaptive interpretation with a potentially more accommodative one.³⁹

Schroder, Driver and Streufert point out that the presence of a large number of members with simple structure in a group ". . . implies increasing centralization of power, decreasing interpersonal communication, decreasing flexibility in role assignments" ⁴⁰ Stager⁴¹ supported this hypothesis. The speculation here is that there is a reciprocal relationship between simple structure functioning and the centralization of administrative authority, i.e., that the latter may very well be the condition of the former, especially in the case of teachers working under consultants, specialists, and CAI. There is certainly evidence that group structures under stress become hierarchial and members show a regression to simple structure.⁴²

This progressive mechanization of individuals and groups may be offset to some extent by education. Schroder, Driver and Streufert⁴³ contrast a unilateral training environment with an interdependent one.

In the former case, the environment is simplified into ready-made rules which are handed down to the individual and learned by him at the request of the training agent. This has the advantage of placing few demands on the individual, but the disadvantage of discouraging a more self-generated type of information processing. In the case of the second type of training, the agent, by providing information in response to the learner's exploratory questions, encourages the generation of new dimensions and organizing schemata.⁴⁴ Presumably teachers and administrators of the latter sort could counteract to some extent the converging pull of technology and corporations in the direction of making us something less than desirably human. MacIntyre has put this general point very well in the context of moral problems:

Knowing how to approach moral problems is a matter of being the right kind of person. And perhaps the first step towards becoming the right kind of person is to have one's imagination captured by an image of what ought to be and can be.⁴⁵

This is brave talk which, as it stands, must yield to Ausubel's⁴⁶ assaults against Bruner's very similar "discovery learning". However, two modifications will place it on a more realistic basis. The first is that its principles must be restricted to material in the fine arts and humanities which lends itself more readily to self-generated rules than that in mathematics and the physical and biological sciences. The second is that this sort of teaching will be restricted to those who can benefit from it, i.e., university-bound students. It is also assumed that the universities will give current teachers in the fine arts and the humanities more than a nodding acquaintance with the social sciences, a point Snow⁴⁷ has made in a different context and Holbrook⁴⁸ had illustrated, or that a special category of teacher in psychology will be devised whose teaching duties would be concerned with the human situation. A scientific treatment of current behaviour problems—divorce, the effect of drugs, oppression, sexual motivation and so forth—would readily elicit and sustain the interest that high school students ordinarily have in behaviour. For example Platonov⁴⁹ has produced a book in which his replies to questions by "young readers" have been developed into a course on behaviour, although the fact that it has a political flavour puts it out of court as far as the present discussion is concerned. At least some experimentation is called for to see what effect such a course would have on students' cognitive structure. The alternatives are despair and hope that a rapprochement between the large corporation and the educational system will be avoided.

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The Critical Path Method has been used extensively as an approach to planning and managing large-scale projects. Its application to the planning and implementation of educational research projects seems feasible. A computer program can be used to obtain the various parameters required for implementation of the method. Research project planners and anyone else concerned with sophisticated approaches to planning could make use of this approach.

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Application of the Critical Path Method to Educational Research Projects

Introduction

This paper consists of a brief examination of some of the possibilities which sophisticated techniques of project planning may hold for planners of educational research. A very rudimentary example of the application of such a technique to a rather small scale project plan will also be presented. Finally, some attempt will be made to suggest the implication of these techniques for educational research planners.

The Techniques

Of the several newly developed techniques for planning (e.g., Operations Research, etc.), one which has been applied to education, in at least a theoretical way, is PERT (Program Evaluation and Review Technique).¹ In his monograph on the educational applications of PERT, Cook demonstrates, through the use of hypothetical research projects, how that particular technique can be useful in both the planning and the implementation process. Parallel to the development, by the U.S. Navy, of the PERT technique, the Du Pont Company developed a similar technique known as CPM (Critical Path Method).² There is

little doubt that the Critical Path Method has become fairly widely diffused in terms of its use in a variety of problem areas. At the same time, one may suggest that some educational researchers will have, at least, heard of the process. However, it appears that application of CPM to educational research project planning is lagging behind the extent of use of PERT. One forms the impression that the U.S. Office of Education has been largely responsible for the diffusion of PERT in that they apparently rely on it as a suitable basis for the development of research projects which they are prepared to support. Whether this lag is more apparent than real is not important for the purposes of this paper. What appears to be useful is a brief exposition of the application of the Critical Path Method, coupled with the observation that PERT is also a powerful tool and that the choice between PERT and CPM would seem to depend on factors not inherent in the techniques themselves.

The Critical Path Method

This Critical Path Method has at least three purposes: (1) to facilitate planning in terms of dividing the project into identifiable “jobs” and scheduling these jobs, (2) to determine which jobs in the project are critical in their effect on the time required for the project, and (3) to determine how resources may be allocated to different jobs in the project in order to meet a target date at minimum cost.

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
SURVEY PROJECT	PROBLEM STATEMENT	OBJECTIVES DATA PARADIGMS HYPOTHESES	
	DESIGN	SAMPLE	UNIVERSE DEFINITION SAMPLING PLAN SAMPLE SELECTION
		INSTRUMENTATION	ITEM CONSTRUCTION TRYOUT FORM FINAL FORM
	DATA	COLLECTION	ADMINISTRATIVE PROCEDURES INTERVIEW SELECTION SCHEDULE ESTABLISHMENT FIELD INTERVIEWS FOLLOW - UP
		ANALYSIS	STATISTICAL TEST INTERPRETATION CODING TABULATION
	DOCUMENTATION	NARRATIVE TABLES CHARTS	

FIGURE 1
TABULAR WORK BREAKDOWN STRUCTURE FOR SURVEY RESEARCH PROJECT

As an aid to logical analysis and planning, CPM can probably best be described by using an example drawn from Cook.³ Although he was working with PERT, the basic work breakdown and network can, with rather minor modifications, be used to illustrate the Critical Path Method. The example used is really a simulation of a survey research project. The planning process is represented in the analyses depicted in Figures 1-3.

The “work breakdown structure” (Figure 1) has four levels of analysis, increasing in detail from Level 1 to 4. More or fewer levels of detail could have been used depending on how capable the project is of being specified into more and more elementary jobs.

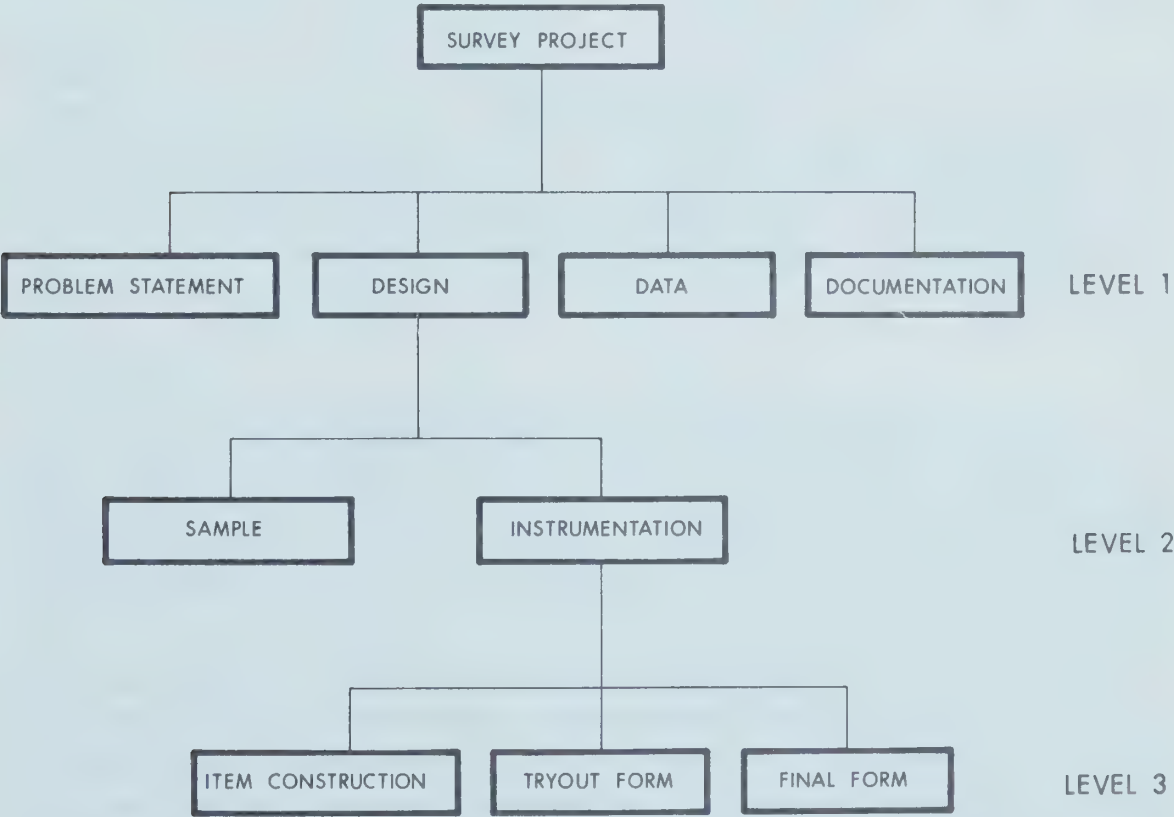


FIGURE 2
PICTORIAL WORK BREAKDOWN STRUCTURE FOR SURVEY RESEARCH PROJECT

The pictorial display in Figure 2 is simply a conventional flow diagram illustrating some of the sequential relations inherent in the project. Finally, in Figure 3 is shown the network for the project. This includes each job in the project and more clearly than either of the other two figures shows the precedence and succession relationships among the jobs. This kind of network is the basic structure to which the critical path algorithm may be applied.

The “critical path” may be defined as the path along and through the summary network which contains only the “critical jobs.” These “crit-

ical jobs" are those which directly affect the total project time. If the time taken for these jobs is reduced, then the total time for the project can be reduced. If resources are to be allocated in an attempt to speed up completion of the project, these critical jobs are the ones which merit attention. Attempting to speed up the project by allocating increased resources to all jobs is not necessary.

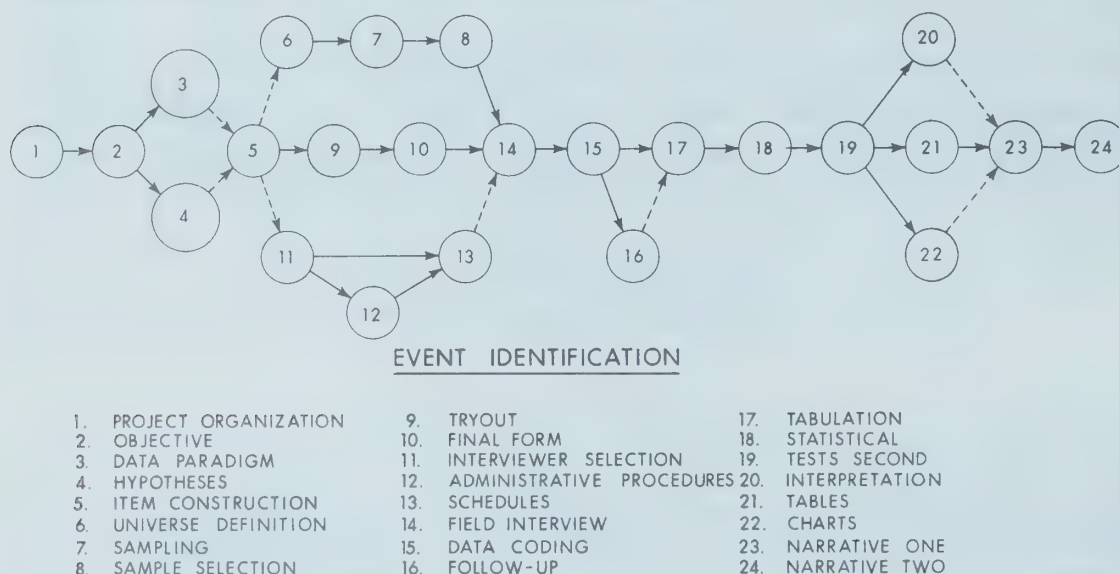


FIGURE 3

SUMMARY NETWORK FOR SURVEY RESEARCH PROJECT

As will be seen in a subsequent section of this paper, most of the jobs shown in the example used here were determined to be critical. In more life-like situations where a larger number of jobs is specified, the percentage of critical jobs is, according to one estimate,⁴ approximately 10 per cent.

A Computer Program for CPM

The literature on CPM suggests that a good deal of work has gone forward in developing computer programs for various applications of the technique.⁵ The program⁶ used with the "survey research project" network was one which produces rather limited output, but which is useful as a tool for demonstrating how planning may be facilitated. Before describing the problem which was to be solved, kinds of data required, and some of the output generated, several terms must be defined and the symbols used in this example must be identified.

Definitions and Symbols⁷

Duration (t)—Length of time (in days, weeks, etc.) that job is estimated to take. It is based on knowledge of probable time requirements, learned through one's own or others' experience with the same or similar jobs.

Target (T)—date of completion of the project.

Early Start Time (ES)—For each job, there is an earliest starting time which is the earliest possible time that the job can begin if all its predecessors are also started at their ES.

Latest Start Time (LS)—For each job, there can be defined a late finish (LF) time; this is the latest time that a job can be finished without delaying the project beyond the target date. For each job, therefore, there is a latest start time (LS) which is equal to $LF - t$.

Early Finish Time (EF)—For each job, the earliest finish time is equal to $ES + t$.

Free Float Time (FF)—the amount of time a job can be delayed without delaying the early start of any other job (operationally, it is the difference between the EF of the job and the earliest ES of its immediate successors).

Total Float Time (TF)—the difference between a job's early start and its late start. It represents the amount of time a job may be delayed beyond its ES without necessarily delaying the completion of the project. (The critical path, for example, includes those jobs with the smallest TF. All non-critical jobs have greater TF.)

The Problem and Procedures

Problem

The problem which the computer program was capable of solving was essentially as follows: What is the critical path for the survey research network? As sub-problems, the following were raised: What are the early start times, late start times, free float times, and total float times of each job in the network?

Data Required

The input data required were those depicted in the summary network (Figure 3); hence the importance of this network as the basic working data for CPM. Each job was labelled to take account of the sequence of jobs from start to completion of the project. For each job, the number of immediately succeeding jobs and their labels (i.e., the numbers shown in Figure 3) permitted the ordering of the jobs by the computer program in a way which corresponded to the original network. For each job, it was necessary to provide an estimate of the duration. This was done on an arbitrary basis using the "day" as the unit of measure. (In more sophisticated programs, an estimate of the duration can be computed and the probability associated with a weighted estimate can also be obtained.)⁸

It is at this point in the process that human error can probably have its greatest effect. As one of the outcomes of using the technique, however, once the critical path has been determined it is possible to check the time estimates for the critical jobs very carefully rather than attempting to make the time estimate for each and every job in the network perfectly accurate. Then, any changes in time estimates arrived at on the basis of these more careful evaluations can be fed into a new CPM network and a new critical path can be calculated (since the calculations are carried out by a computer program, the iterative nature of this part of the process is not at all a limitation on using the technique).

TABLE I
INPUT DATA

Label	Duration	Name	No. of Following Activities	Labels of Following Activities		
1	1	PROJ. ORGAN	1	2		
2	14	OBJ.	2	3	4	
3	2	DAT. PARAD.	1	5		
4	4	HYP.	1	5		
5	5	ITEM CONST.	3	6	9	11
6	7	UNIV. DEF.	1	7		
7	2	SAMPLING	1	8		
8	2	SAMPLE SEL.	1	14		
9	10	TRYOUT	1	10		
10	4	FINAL FORM	1	14		
11	3	INTERV. SEL.	2	12	13	
12	12	ADM. PROC.	1	13		
13	2	SCHEDULES	1	14		
14	4	FIELD INTERV.	1	15		
15	6	DATA CODING	2	16	17	
16	5	FOLLOW-UP	1	17		
17	5	TAB	1	18		
18	10	STAT. TESTS	1	19		
19	8	TESTS SECOND	3	20	21	22
20	4	INTERP.	1	23		
21	3	TABLES	1	23		
22	2	CHARTS	1	23		
23	2	NARR. ONE	1	24		
24	21	NARR. TWO	0			

A summary of the data input for the problem under discussion here is provided in Table I. For each job, a label (in terms of the sequential numbers in the network), an estimate of duration, the name of the job, the number of following activities, and the label(s) for the “following” activities are input.⁹

Output

In general, the available CPM programs will output a series of “reports” which present the network analysis in terms appropriate to various requirements of the research planner. In the typical programs, these are available as optional output; in the newer, modular programs (such as PMS/360),¹⁰ these various reports are part of the modular structure.

For the survey research project, only one of the “reports” is presented here as Table II. This particular report presents the job in order of early start times. For each job, the input label and duration are shown. The symbols ES, LS, EF, LF, FF, and TF represent the variables defined earlier in this paper. The asterisks beside some of the jobs indicate that these are the “critical jobs” which, therefore, comprise the critical path.

In Figure 4, the network for the survey research project is shown with the partial shading indicating the critical jobs. As was indicated earlier, the proportion of critical jobs is quite high.

TABLE II
JOBS IN ORDER OF INCREASING EARLY START TIMES

LABEL	DURATION		DESCRIPTION	ES	LS	EF	LF	FF	TF
1	1	*	PROJ. ORGAN	0	0	1	1	0	0
2	14	*	OBJ.	1	1	15	15	0	0
3	2		DAT. PARAD.	15	17	17	19	2	2
4	4	*	HYP.	15	15	19	19	0	0
5	5	*	ITEM CONST.	19	19	24	24	0	0
6	7		UNIV. DEF.	24	30	31	37	0	6
9	10		TRYOUT	24	27	34	37	0	3
11	3	*	INTERV. SEL.	24	24	27	27	0	0
12	12	*	ADM. PROC.	27	27	39	39	0	0
7	2		SAMPLING	31	37	33	39	0	6
8	2		SAMPLE SEL.	33	39	35	41	6	6
10	4		FINAL FORM	34	37	38	41	3	3
13	2	*	SCHEDULES	39	39	41	41	0	0
14	4	*	FIELD INTERV.	41	41	45	45	0	0
15	6	*	DATA CODING	45	45	51	51	0	0
16	5	*	FOLLOW-UP	51	51	56	56	0	0
17	5	*	TAB	56	56	61	61	0	0
18	10	*	STAT. TESTS	61	61	71	71	0	0
19	8	*	TESTS SECOND	71	71	79	79	0	0
20	4	*	INTERP.	79	79	83	83	0	0
21	3		TABLES	79	80	82	83	1	1
22	2		CHARTS	79	81	81	83	2	2
23	2	*	NARR. ONE	83	83	85	85	0	0
24	21	*	NARR. TWO	85	85	106	106	0	0

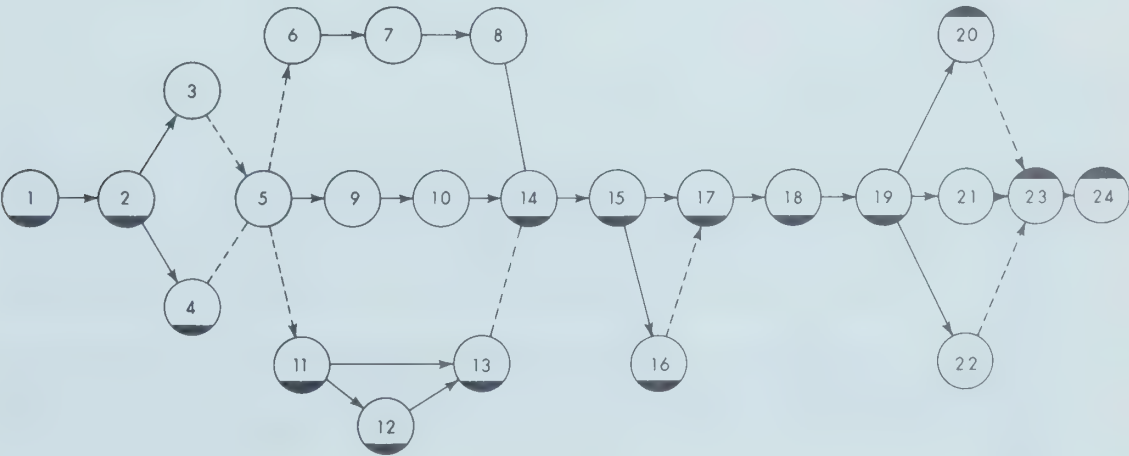


FIGURE 4
THE CRITICAL PATH

Again, it should be emphasized that in a more detailed network the percentage of critical jobs may be as low as 10 per cent.

Summary and Implications

A brief description of the critical path method as an approach to project planning has been provided. A hypothetical example was used to illustrate how a computer program may be used to determine the

critical path and to obtain several useful measures descriptive of a research project.

The implications of CPM (or, for that matter, of PERT) for research project "administrators" would seem to be reasonably clear. First, use of the method requires that systematic planning and a rather detailed job analysis will occur. Second, where time and other resources must be carefully allocated, determining the critical path enables research administrators to make the best use of these resources. Finally, experience in the application of CPM to research project administration is likely to have secondary pay-off. This would be in terms of the skill in using this rather powerful tool in a variety of other applications such as implementation of innovations, training programs for researchers, short and long-term development plans, installation of computer equipment, and so on. Further application of CPM (and its close relatives) to a variety of educational projects of either a research or development nature would seem to merit the interest and activity of researchers.

REFERENCES

- ¹ Desmond L. Cook, *Program Evaluation and Review Technique Applications in Education*, (Washington, D.C.: U.S. Government Printing Office, 1966).
- ² See, for example, F. K. Levy, G. L. Thompson, and J. D. Wiest, "The ABC's of the Critical Path Method", *Harvard Business Review*, Vol. 41, No. 5, (Sept.-Oct., 1963), pp. 98-108.
- ³ Cook, *op. cit.*, pp. 38-41.
- ⁴ Levy *et al.*, *op. cit.*, p. 99.
- ⁵ See, for example, Levy *et al.*, "Mathematical Basis of the Critical Path Method", in J. F. Muth and G. L. Thompson (Eds.), *Industrial Scheduling*, (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1963); I.B.M., Project Management System for IBM System 1360, Technical Paper No. H20-0210-0, (White Plains, N.Y.: IBM, 1966).
- ⁶ J. A. George, *Critical Path Scheduling*, (Edmonton: Department of Computing Science, The University of Alberta, 1966). According to George, this program was adapted from an algorithm developed by C. W. Baker at Stanford University.
- ⁷ These definitions are, in the main, drawn from Levy *et al.*; the symbols are those used in the computer program output.
- ⁸ Cook, *op. cit.*, p. 29.
- ⁹ Further details regarding parameter cards, limits on the number of jobs, etc., are found in George, *op. cit.*
- ¹⁰ IBM, *op. cit.*

A modified technique for assessing the child's acquisition of length conservation was designed and tested on 62 subjects aged 5-4 to 8-0. The technique attempted to eliminate or minimize the confounding effects of dependence on verbal means of communication, no understanding of instructions, failure to perceive the initial comparison, forgetting, perceptual estimation and guessing.

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Conservation of Length: Methodological Considerations

Since Piaget's discovery of conservation as a behavioural attribute involved in the child's acquisition of operational thought, many replicative studies have been done confirming the *existence* of the phenomenon of conservation with the result that conservation is generally accepted as a valid attribute in describing the child's cognitive status. These replicative investigations have given way to studies which attempt to relate the phenomenon of conservation to other cognitive variables.^{1,2,3,4,5} However, the techniques used in these later investigations to obtain a measure of conservation are essentially the same as those used in the replicative studies. Unfortunately, techniques useful for showing the *existence* of a phenomenon may be neither precise enough nor powerful enough to establish the relationship of the phenomenon to other variables.

Suppose, for example, that we wished to test a simple hypothesis involving the relation of verbal and nonverbal IQ to the acquisition of conservation of length. Suppose further that we classify students as being conservers or nonconservers on the basis of the "usual" procedure typified by the following:

1. Two rods of equal length are placed in front of S as indicated in Figure 1.
S is asked, "Which stick is longer, or are they both the same length?" Most S will say that they are the "same."

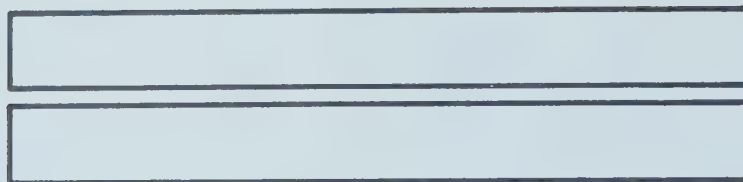


Figure 1.

Rods aligned in "identity position."

2. One of the sticks is transformed (e.g., pushed a few inches to the left or right).
3. S is asked, "Which stick is longer now, or are they still the same length?"
4. Sometimes the question "WHY?" is asked.

In the above procedure there is a heavy reliance on verbal means to communicate to S that he is to respond on the basis of length. In fact, the only way S has of knowing that the attribute under consideration is length is that E used the word "length" or "longer" or some such synonym. Sometimes verbal descriptions, such as "a boy walking along a path" or "two ants going on a walk", are used to communicate to S the criteria he is to use when responding. These verbal descriptions tend to encourage responses based on anthropomorphic criteria which could confound the measure obtained.

If we could couch our description of the criteria of response in a logical rather than a purely verbal form, we could not only give a clearer and more precise definition of the response criteria, but also increase the likelihood that S would respond logically, if, of course, he is capable of doing so. Braine^{6,7,8} has reported studies indicating some of the disadvantages of employing a technique which is crucially dependent on verbal means of communicating the response criteria to S. Smedslund^{9,10} has cast some doubt on Braine's findings, but regardless of the final outcome of the Braine-Smedslund interchange (see Gruen¹¹) it still remains that the measure of conservation derived from the procedure outlined above is so heavily loaded with a built-in verbal factor that its usefulness is severely limited.

Furthermore, such a procedure, dulled as it is by an overlay of verbal dependencies, would probably not possess the necessary sensitivity for detecting the threshold emergence of conservation in young children. In designing training programs for these children it is extremely important that such threshold levels be determined with some degree of precision.

In general, what is needed is a measure of conservation which is maximally free from confounding influences. Such a measure might be called "relatively pure". This paper presents a modified technique for

assessing conservation, and reports, briefly, on an experiment using the technique as a partial evaluation of its effectiveness.

The Problem

In order to design a technique which will give us a relatively pure measure of conservation it would be beneficial to make some basic distinctions concerning the relationship of conservation to concepts in general. At a minimum, we need to distinguish between the concept of a particular attribute (e.g., number, length, time, volume), and the concept of the conservation of the magnitude of that particular attribute. Although the concept of the conservation of the magnitude of an attribute is certainly a part of the concept of the attribute itself, the two are not identical. We are interested only in the conservation aspect of the concept, not in the child's *general* understanding of the attribute.

This basic distinction will be more useful if the following general model for attaining concepts about attributes is adopted. Growth in understanding of a particular attribute can be conceived of as a process of refining a concept already present. With additional refinement, the concept becomes more and more sophisticated. There has to be a starting point, a minimal concept which specifies, rightly or wrongly, when an object possesses the attribute. With respect to the attribute of length, a minimal concept would be that objects take up space, this space being related to the separation of the extremities of the object. More sophisticated concepts would recognize other properties of the expanse between extremities, e.g., that the expanse can change. The recognition of this property would constitute a refinement of the child's concept of length. Other refinements would involve the association of verbal stimuli with the concept. Such words as *big*, *tall*, *high*, *short* and *long* may invoke the concept. The distinction between the words *long* and *high*, *long* and *tall* and so on would be other refinements. A further refinement would be the recognition of the conditions under which the expanse changes, and perhaps concomitantly, the conditions under which the expanse does not change. The acquisition of these last two refinements is fundamental to conservation since, from an experimental point of view, an operational definition of conservation of length could be in terms of the child's success in specifying which actions (transformations) performed on an object will change the length, and which will leave length invariant. It is the acquisition of the last two refinements that is being tested when testing for conservation of length. Whether or not other refinements have been acquired becomes crucial only if such refinements are necessary for the valid use of the testing technique. The measure of conservation will be confounded with these other refinements if the testing technique is based partially on refinements generally acquired after the refinements being tested for.

The above formulation implies, first, that the testing technique should, as far as possible, be dependent only on refinements which occur prior to the refinements being tested for. The second implication is that in order to test any given refinement, E must communicate clearly to S the basic concept underlying the refinement.

The testing technique described in this paper was designed to fulfill these two conditions. In addition, the design was based on the assumption that children in the process of acquiring conservation of length, being somewhere between Piaget's stages of Pre-Operational and Concrete-Operational Thought, feel most comfortable and operate at their highest levels of competence when dealing with concepts embodied in *physical* objects and in *physical* action.

The Technique

It is readily apparent that the "usual" method of measuring conservation of length does not satisfy the requirements of the implications stated above. First, the method assumes that S has acquired the verbal refinement of ideas specified by the word *length*. However, a given S might associate the word length with the location of the extremities of the objects. He would say that the lengths are the same when objects are aligned in identity position (Fig. 1), but he would judge the length to have changed after the transformation was applied since the location of the extremities did indeed change. Such a S would be classified as a nonconservers. Can we be sure that he is a nonconservers, or might the conservation measure be confounded with the verbal requirements?

Second, E has no way of knowing what criteria S is using to decide whether length has changed. E can ask S why he responded as he did, but such a question assumes again that S has acquired verbal refinements related to his concept of length. The technique reported here attempts to overcome these criticisms as well as some other routine sources of error.

In general, the two criticisms can be overcome by (1) using physical apparatus and physical action to communicate to S the attribute under consideration, and (2) enabling S to give his response in a like manner. The objective with respect to (1) is to present S with a precise definition of the attribute under consideration. When the two rods are aligned in identity position (Fig. 1), the location of the endpoints and the lengths of the rods are the same. Hence the rods themselves do not clearly define the attribute under consideration. In fact, *any* attribute which has the same value for both rods in identity position could be the attribute S chooses to consider.

Since all methods for ascertaining conservation involve the process of comparison (either one object with another, or the same object with itself), and since the process of comparison is essentially the basic process

involved in measurement, the definition of the attribute could be made more precise by making the process of comparison explicit. Since the process of comparison made explicit is simply the process of measurement, the objective can be achieved by *measuring* the magnitude of length, and, as with many other cognitive phenomena, letting our measuring device define that which we are measuring.

Toward this end, one of the rods can be the measuring device, and the other the device to be measured. A crude pair of calipers can be made by attaching physical markers to the ends of the rod and affixing a small handle for ease of operation (Fig. 2). S can then be trained to use the calipers as E wishes him to.

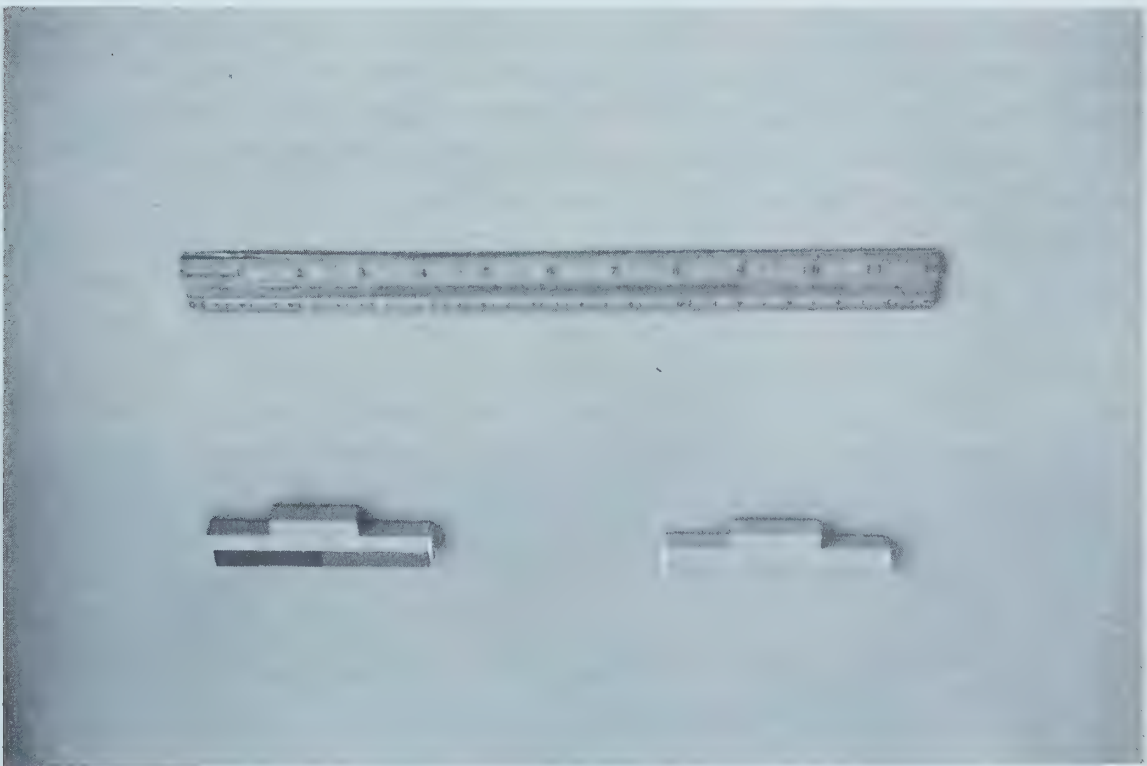


Figure 2.

Two calipers: (left) alone, (right) fitted on an object.

In such a training session, the rods could fit the calipers in only three ways. The rod could be .5 cm. too short for the calipers, just right for the calipers, or .5 cm. too long for the calipers. (Any appropriate expanse could have been chosen.) Thus, the three different fits would be defined to S. Not only would the application of the calipers give a physical definition of length, but the three different fits, differing as they do in only one respect, would also help to communicate to S the attribute under consideration. Therefore, the attribute being manipulated would also be the attribute under consideration. Zimiles¹² has pointed out that many

procedures include so much manipulation of irrelevant variables that S may not be aware of the correct criterion to use in responding. For example, the manipulation of the length of a row of checkers when the attribute under consideration is number may lead S to infer that E really wants him to respond on the basis of length.

The second major objective of the proposed technique is to enable S to use the physical apparatus (1) to facilitate his decision-making about the changes in the magnitude of the attribute, and (2) to communicate his decision to E. The three different fits previously distinguished can be used to accomplish this second objective as well as the first. A three-choice response apparatus could be constructed so that each fit is associated with one of the choices (Fig. 3). The following sequence could then be carried out. A rod and calipers are placed in front of S. S inserts the rod in the calipers (or applies the calipers to the rod) noting the fit. E then removes the calipers and applies a transformation to the rod. S *predicts* how the calipers will fit on the transformed rod by making one of the choices on the response apparatus. Embodied in his choice is his decision about the effect of the transformation on length. Once S understands what is required of him, and this can be accomplished through a training session, there need be no verbal exchange between S and E.



Figure 3.

The response apparatus with rods inserted into calipers by S.

The Experiment

In order to test the feasibility of the proposed technique, and to provide some evaluation of its effectiveness, the technique was tried on young children.

Sample

Sixty-four kindergarten and grade one children were randomly selected from a population of 196 such children attending two schools servicing the Canadian Armed Forces Barracks at Griesbach near Edmonton, Alberta. Most of the fathers were enlisted men of the Corporal or lower rank. Two of the S's had to be excluded from the study: one because he could not meet one of the criteria in the training session and the other because of illness.

Apparatus

There were three major parts to the apparatus: (1) calipers, (2) objects possessing the attribute of length, and (3) a response apparatus.

The calipers were of three magnitudes: 9 cm., 9.5 cm., and 10 cm. The objects were of three kinds—plasticine, wood, and cigarettes—and ranged in length from 1 cm. to 10 cm. The objects could easily be combined to give composite objects possessing "multiple segmented lengths". The response apparatus had 3 doors, each of which could display a candy reward when opened. As suggested earlier, the rods (objects) always fitted the calipers in one of three ways: the rod was .5 cm. too short for the calipers, the rod was just right for the calipers, or the rod was .5 cm. too long for the calipers. The association between each of these fits and the appropriate door on the apparatus was facilitated by placing a "model fit" above the door.

Procedure

Each S was tested individually by the investigator in a session which lasted from 30 to 40 minutes per S. First S was trained and then tested.

The Training Session: As can be gathered from remarks made previously, the crucial part of the technique lies in communicating clearly to S precisely what is required of him and how he is to use the apparatus to make decisions and communicate them to E. Therefore, a detailed account of the training session is given here.

The training session, which lasted from 7 to 12 minutes, had four specific objectives: (1) to train S how to use the calipers, (2) to train S to distinguish among the three kinds of fits, (3) to train S to associate each type of fit with one of the doors on the response apparatus, and (4) to train S to predict the fit of the calipers after E had given the object a transformation.

Objective 1: S was seated in front of the response apparatus (Fig. 3). S was asked if he had ever played with the material on the table and invariably S said no. "Let me show you how." E picked out a 9 cm. caliper and (4, 3, 2)* rods and placed them on the table with one of the rods on end. "We try to push these (pointing to calipers and pushing them slightly toward the rods) onto these sticks." After a slight pause, E said, "But, to make it easier we do this first. We lay the sticks down like this (upright stick is laid horizontally), and put them along here (along the front edge of the box containing the rods) nice and close (gaps are closed between sticks) in a straight line." E brings the sticks back into random formation and says, "Now you try it." Every S could arrange the rods properly. "Now see if you can push these on." S pushes the calipers on and is assisted if necessary. "Those rods fit nicely, don't they? Here, let's try these (9.5 calipers; 5, 3, 2 rods)." Several other examples were given illustrating the three different kinds of fits, thus leading to the next objective.

Objective 2: S was asked if all the sticks fit the same and invariably all S said no. S was encouraged to verbalize the differences in the three fits, but if he did not, he was not urged. If S did volunteer words to describe the fits, then E used S's terminology when referring to the various fits.

Objective 3: After distinguishing the three fits, S's attention was directed toward the three calipers lying on the response apparatus, each of the calipers with an accompanying rod placed parallel to it and about an inch from the calipers. S was directed to place each caliper onto its accompanying rod, and all S agreed that each fit was different. E asked S to tell or show him how they were different, and again E did not insist on verbal replies. S was shown the doors directly below the model fits and how they opened. The one-to-one correspondence between the doors and the fits was established by the designation by E of a fit (either by pointing or by using S's terminology) and the opening of the corresponding door by S.

E then placed calipers and rods in front of S and S applied the calipers. "Which one of these is it like?" If S designated the proper model fit, E asked, "Then which door are you going to open?" If S designated the wrong fit, he was told to look closely and try again. All incorrect designations were the result of hasty and imprecise applications of the calipers, and after trying again these S's realized that they had to apply the calipers carefully if they were to open the "correct" door and find the candy reward. Thus S was aware that close observation of the fit was necessary. S was then asked if he thought there would be candies behind the other two doors, and was invited to try them. There were no candies behind

*Denotes a 4 cm. rod, 3 cm. rod, and a 2 cm. rod.

the wrong doors. S was encouraged to verbalize as to why not, and again E did not insist.

Several other combinations of calipers and rods resulting in different fits were tried, and after S made 4 consecutive correct responses (i.e., found the candy), the final phase of the training session was begun. All except one exceptional S could meet the criterion of 4 consecutive correct responses, and all S took 7 or fewer trials ($p = 4/81$, at a maximum). The exceptional S, who had a very low IQ, was excluded from the study.

Objective 4: At this stage, all S agreed that it was easy to find the candy, as indeed it was. "Well since it's so easy, I'm going to change the game so that it's not quite so easy, and this time you can keep the candy when you find it. I'll show you what we're going to do; watch closely so that you'll be able to find the candy. We're going to do three things. First you put the calipers on the sticks just as before (S does so). Next I'm going to do something to the sticks (E removes the calipers and transforms the sticks). Now if you put these (calipers) on again in the way you always do, would they be like this, or this, or this (pointing to model fits)?" Some S pointed at a model fit, but some started to put the calipers on again. For those who pointed at a fit E said, "Where's the candy going to be then? Find it." If S found the candy he was told, "Yes, that's right. That's what it would look like." If S failed to find the candy (i.e., designated the wrong fit) he was told, "No, I guess it wouldn't be that one. It would be like this one or that one." (Parenthetically, it should be noted that up to this point the general objective has been to specify to S that length is the attribute under consideration. It now remains to specify to S that the refinement of conservation is the crucial variable.) For those S who started to put the calipers on the rods, E interrupted and said, "That would make it too easy if I let you do that. I want you to tell me what it would look like without having to put these on. Would it be like this, or this, or this?"

All S were required to do additional examples and all S appeared to grasp what was required of them. In the additional examples E inserted the sentence, "You saw what I did to the sticks. What's it going to look like now, this, or this, or this?" In an attempt to prevent the child from getting the idea that he merely had to choose the original fit again, two of the transformations used changed the length of the rods. The test itself was then begun.

The Test

The 24 test items were given in exactly the same manner as the last examples in the training session. Sixteen of the transformations left length invariant, while eight changed the magnitude of length. The transformations consisted of such actions as (1) rotating the rod(s),

(2) translating the rod(s), (3) adding or subtracting a portion of the rod(s), (4) rolling the plasticine rod, thus elongating it, and (5) cutting a portion of the filter off a cigarette (or adding it on).

Administration of the test: An attempt was made to minimize the confounding influence of several variables:

1. Guessing. In a multiple choice context, guessing plays a prominent role. To counteract its effect, each of the three doors led to a candy reward an equal number of times (8, 8, 8); twenty-four items were used instead of the usual three or four; and S was told that if he was careful and watched what E did to the rods, he could find the candy *every time*.

2. Perceptual estimation. To counteract perceptual estimation the calipers were at no time left in a position parallel to the rods. After removing the calipers, E usually held them partially concealed in his hand, or laid them perpendicular to the rods when possible.

3. Disinterested performance. The use of candy rewards, the novelty of the apparatus and of the technique, along with the active involvement of S throughout the testing session helped to overcome lack of interest.

4. Forgetting. It was crucial that S remember how the rod fit before the transformation was applied. To minimize the role of forgetting, any time that S appeared to forget the initial fit E said, "Did you forget how it fit before? It looked like this one. You saw what I did to the sticks. Which one do you think it's going to be now? Find the candy." Moreover, S was informed that if he ever forgot, he should ask E.

Results

In order to assess the feasibility and effectiveness of the technique it was assumed that if the technique did in fact remove several confounding influences, then the removal of such confounding influences should be reflected in the increased success that younger children would experience with the technique as compared with the success they would have with the usual method. In discussing the age of acquisition of concrete-operational thought processes, Braine^{13,14} and Smedslund^{15,16} reported their results as threshold ages determined by finding the age interval for which 50% of the subjects in the interval possess the thought process. On this basis they estimated, for Piaget's¹⁷ results, the threshold age for the acquisition of conservation of length to be between 7 and 8 years of age. Murray¹⁸ reported similar threshold ages. Thus, on the basis of the rationale presented here, the effectiveness of the proposed technique can be determined by testing the hypothesis that the technique will result in a significantly lower threshold age for the acquisition of conservation of length.

Before any results concerning the threshold age can be reported, criteria to determine when a given S can be considered a conserver must

be specified. In most tests of conservation, the decision-making process which confronts S can be conceived of as essentially a process of classification. S has to classify the transformations applied to the objects into two mutually exclusive categories: those transformations which leave length invariant and those transformations which change the magnitude of length. In this kind of situation, guessing would give 50-50 results. For the technique used in this study, the involvement of three different fits made possible a finer classification of transformations: those which decreased length, those which left length invariant, and those which increased length. A conserver was one who could classify the transformations correctly in these three categories.

Assuming that all important confounding influences were controlled, and since a three-way response apparatus was used, the probability of a correct response from a nonconserver is no more than one in three. For the purposes of reporting results, the 16 test items which left length invariant were divided into two sets of 8, one involving rotations and the other translations. Each of these sets of 8 was combined with the 8 items which did not leave length invariant. Thus, there were two overlapping subtests of 16 items each. Since half of the items in each subtest changed the magnitude of length, the probability was minimized that any S would maintain the strategy of responding on the basis that the fit after the transformation would be the same as the fit before the transformation.

With $\theta = 1/3$ and $N = 16$, a score of 11 correct responses would be significantly better than chance at the .01 level using the binomial distribution.

Table 1 shows, for each subtest, the number and percentage who reached the criterion in each age interval. Data presented in the table indicate that the threshold age for conservation of length, using the proposed technique, is somewhere between 5-4 and 6-2. These ages are about 2 years lower than those obtained using the usual technique. The hypothesis concerning the effectiveness of the proposed technique is therefore accepted.

Discussion and Summary

A modified technique for assessing the child's acquisition of the conservation of length was presented and evaluated. An attempt was made to control for the following confounding influences: guessing, perceptual estimation, misunderstanding of instructions, misconception of the response criteria, failure to perceive the initial comparison of lengths (perception of the initial "fit"), forgetting the initial comparison, lack of a nonverbal way of expressing decisions, and disinterested performance.*

Perhaps the strongest modification in the proposed technique is the use of physical apparatus to make the technique highly concrete and

*Based on Smedslund's analysis (1963).

more precise, thus overcoming the vagueness and imprecision associated with children's language. However, a price must be paid for introducing such precision, the price being embodied in the logical relations built into the use of the apparatus. The crucial question is whether the dependence on a minimal logical competence is more confounding than the dependence on a minimal verbal competence. Since the experiment resulted in threshold ages about 2 years lower than the usual ages, it is concluded that when the required logic is embodied in concrete operations with physical apparatus, the young child is better able to reveal his threshold acquisition of cognitive processes.

TABLE I
ACQUISITION OF THE CONSERVATION OF LENGTH WITH RESPECT TO AGE

Age Group	No. of Ss	Subtests Serving as Criteria			
		Rotations and Non-Inv		Translations and Non-Inv	
		N	%	N	%
7-2 to 8-0	15	14	93	15	100
6-3 to 7-1	22	19	86	17	77
5-4 to 6-2	25	19	76	16	64

Note: 1. Ss were classified as conservers if the number of correct responses they gave on a particular criterion was significant at the .01 level.
2. "N" designates the number of Ss with conservation.
3. "%" designates the percentage of Ss with conservation.

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For three samples of Metis and Eskimo pupils, several culture-reduced measures of general intellectual ability are shown to have substantial validity in predicting school achievement over three and four year periods. For the Metis sample the predictive validities of two such culture-reduced tests did not differ from those of conventional intelligence tests.

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Longitudinal Prediction of School Achievement for Metis and Eskimo Pupils

Elley and MacArthur,¹ Olson and MacArthur,² and West and MacArthur,³ have identified several "culture-reduced" tests which seem less bad than certain other widely-used tests in helping to assess the general intellectual potential of Edmonton Whites of lower socioeconomic status, of Edmonton Whites of foreign language background, and of Metis and Indian pupils of the Canadian North. Such tests as the Progressive Matrices, the IPAT test of g, the Safran Culture-Reduced Intelligence Test (SCRIT), and certain subtests of the Lorge-Thorndike Intelligence tests, when compared with conventional intelligence tests, showed less cultural bias for pupils such as these, while at the same time having substantial correlation with more conventional measures of scholastic aptitude and with concurrent school achievement.

Assessment of intellectual potential of pupils is prognostic as well as diagnostic. Given a fair estimate of intellectual potential, we want to predict future academic or general success. The main purpose of the investigation reported here was to study some promising "culture-reduced" tests of general intellectual ability to assess their long-term validity in predicting school achievement for three samples of Indian-Metis and Eskimo pupils. Other problems investigated and reported elsewhere

by Rattan⁴ included the stability of the culture-reduced tests and the relationship of both culture-reduced and conventional tests to certain background variables and concurrent school achievement.

Method

Samples

In 1961 a number of ability tests were administered to the 74 Metis pupils who were then in grades one to three at Faust, Alberta. The 1961-65 Metis prediction sample consisted of the 45 of these pupils who were still attending school at Faust and who were tested again in 1965. Mean scores as of 1961 on several variables for the prediction sample of 45 cases were as follows, with corresponding means for the total original sample of 74 cases in brackets: Grade—1.89 (1.82); Age—8.5 (8.6); Socio-economic Index (Blishen Scale)—37.8 (37.5); Language Other Than English Rating—3.3 (3.3); Progressive Matrices I.Q.—102.3 (102.2); California Test of Mental Maturity Total I.Q.—89.9 (88.8); Detroit Beginning I.Q.—89.0 (89.2). Fortunately, on these variables the prediction sample is clearly representative of the original sample.

Some 1965 descriptive data for this Faust Metis 1961-65 prediction sample and for two Eskimo 1962-65 prediction samples from Inuvik and Tuktoyaktuk are reported in Table I.

TABLE I
SOME DESCRIPTIVE DATA FOR THREE PREDICTION SAMPLES

Status in 1965		Faust Metis 1961-65	Eskimo Young 1962-65	Eskimo Middle 1962-65
N		45	62	37
Age	Mean	12-6	11-3	13-11
	Range	9-8 to 15-3	9-3 to 12-3	12-4 to 15-1
Grade	Mean	5.7	3.7	5.8
	Range	3 to 7	1 to 7	3 to 8
SES	Mean	38	38	38
	Range	30 to 57	30 to 57	30 to 57
Sex	M	24	36	18
	F	21	26	19

Procedures

Raw scores on each test or subtest were normalized and converted to T-scores, based on the respective samples taken separately, with means of fifty and standard deviations of ten. Pearson product-moment correlations were then computed between the 1961 or 1962 predictors and the 1965 criterion variables. Differences in correlation with 1965 school achievement for culture-reduced and conventional predictors were tested using the t-test for correlated samples. Multiple correlation coeffici-

ents of two or more predictors with California Total Achievement scores for the Metis sample were also examined, and the relative contributions of the various predictors toward the prediction of school achievement are reported in Rattan.⁵

Results

Some results of the prediction study are reported in Tables II, III and IV. Table II shows predictive validity coefficients between several of the ability tests administered in 1961 and the Reading, Arithmetic, Language and Total scores on the California Achievement tests administered in 1965 for the Faust Metis prediction sample. The upper half of Table II shows correlations based on scores *normalized* over this group for Coloured Progressive Matrices, Safran Culture-Reduced Intelligence Test, and various subtests of the California Test of Mental Maturity. The lower half of Table II shows correlations based on *intelligence quotients* for Coloured Progressive Matrices, Detroit Beginning First-Grade Intelligence Test, Lorge-Thorndike Intelligence Test, and subtests of the California Test of Mental Maturity.

Table III represents the core of this article. It shows that for the same Metis group, using California Achievement Total in 1965 as the criterion, the so-called culture-reduced measures Coloured Progressive Matrices and SCRIT do not differ significantly from any of the conventional ability

TABLE II
CORRELATION COEFFICIENTS BETWEEN MENTAL ABILITY TESTS
ADMINISTERED IN 1961 AND CALIFORNIA ACHIEVEMENT
TESTS ADMINISTERED IN 1965
Faust Metis Sample (N=45)

1961 Predictors	1965 Achievement Criteria			
	Calif. Rdg.	Calif. Arith.	Calif. Lang.	Calif. Total
Normalized Scores				
Progressive Matrices	.57	.52	.49	.57
SCRIT	.60	.56	.57	.62
CTMM Spatial	.48	.39	.24	.37
CTMM Non-Language	.59	.54	.37	.50
CTMM Logical	.54	.61	.50	.59
CTMM Numerical	.59	.65	.39	.52
CTMM Verbal	.57	.51	.46	.54
CTMM Language	.70	.74	.56	.68
CTMM Total	.70	.71	.50	.64
Intelligence Quotients				
Prog. Mat. I.Q.	.44	.30	.48	.47
CTMM Non-Lang. I.Q.	.35	.21	.24	.30
Detroit Beg. I.Q.	.37	.37	.43	.42
Lorge-Th. I.Q.	.24	.22	.40	.30
CTMM Lang. I.Q.	.46	.39	.46	.48
CTMM Total I.Q.	.45	.33	.40	.43

TABLE III
SIGNIFICANCE LEVELS OF DIFFERENCES IN CORRELATION COEFFICIENTS
WITH 1965 CALIFORNIA TOTAL ACHIEVEMENT SCORES
FOR CULTURE-REDUCED AND CONVENTIONAL 1961 PREDICTORS
Faust Metis Sample (N=45)

Normalized Scores	r with Achievement	Prog. Mat. .57	SCRIT .62	CTMM Spat. .37	CTMM N-L .50
CTMM Logical	.59	.....	.....	.....	.....
CTMM Numerical	.52	.....	.....	.....	.....
CTMM Verbal	.54	.....	.....	.....	.....
CTMM Language	.68	.....	.....	**	*
CTMM Total	.64	.....	.....		
Intelligence Quotients	r with Achievement	Prog. Mat. I.Q. .47		CTMM N-L I.Q. .30	
Detroit Beg. I.Q.	.42		.....		.....
Lorge-Th. I.Q.	.30		.....		.....
CTMM Lang. I.Q.	.48		.....		.....
CTMM Tot. I.Q.	.43		.....		

..... Not significant at .05 level.
* Significant at .05 level.
** Significant at .01 level.

TABLE IV
CORRELATION COEFFICIENTS BETWEEN MENTAL ABILITY TESTS
ADMINISTERED IN 1962 AND VERNON ACHIEVEMENT TESTS
ADMINISTERED IN 1965
Eskimo Samples

Sample	1962 Predictors	1965 Achievement Criteria		
		Vernon Eng.	Vernon Arith.	Vernon Vocab.
Esk. Young N = 62	Prog. Mat. Coloured	.42	.45	.42
	Otis Alpha N.V.	.59	.69	.61
Esk. Middle N = 37	Prog. Mat. Standard	.62	.69	.49
	L-Th N.V. Level 3	.71	.71	.66

tests listed down the left in their predictive validity coefficients. From the data of Table II, similar comparisons may be made using California Achievement subtests as criteria.

Table IV reports, for the two Eskimo samples, very useful predictive validity coefficients between culture-reduced ability tests administered in 1962 and Vernon achievement tests administered in 1965. Conventional ability predictors were not available for the Eskimo for comparison purposes.

It should be pointed out that for all three samples no special treatment programs were instituted during the prediction interval, beyond the usual programs of the schools concerned.

Discussion

Most education philosophies require that instruction be adapted to suit the needs and abilities of individual pupils. This presupposes a fair estimate of their intellectual potential. Cronbach⁶ suggests that mental ability tests ought to help locate undeveloped potential that novel treatment may bring out. In order that novel treatments may be planned and carried out, there should be reasonable assurance that the tests indicating potential remain fairly stable over periods of time and show substantial long-term predictive validity.

West and MacArthur⁷ have provided evidence that, for Metis and Indian pupils at Faust, Alberta and Fort Simpson, N.W.T., such tests as Progressive Matrices, Safran Culture-Reduced Intelligence Test, and Lorge-Thorndike Non-Verbal Intelligence Test Level 3 are significantly less biased against these pupils than are conventional intelligence tests. The current study provides evidence that these three culture-reduced tests also have substantial long-term predictive validity for the Metis and Eskimo samples studied. Further, Coloured Progressive Matrices and SCRIT, for the Metis sample, did not differ significantly from the more conventional California Test of Mental Maturity Language and California Test of Mental Maturity Total in predicting California Achievement Total scores over a four-year period. However, they were inferior to the same conventional tests in the prediction of California Arithmetic scores.

This evidence would seem to suggest that such culture-reduced measures of general intellectual ability should be included in testing programs aimed at helping us understanding and adapt instruction to the abilities and potential of individual native pupils. However conditions are changing so rapidly, and may vary so much from one area to another, that predictive validities may change and vary similarly. Long-term validity studies such as this should also be an integral and continuing part of any testing program.

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In this study the author cites experimental evidence to suggest that the use of the Primary Mental Abilities Test in place of the Differential Aptitude Tests can be recommended without loss of predictive validity and with a saving in time for students and counsellors.

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Relative Effectiveness of Aptitude Tests

Introduction

For many years, schools in Ontario and several other provinces in Canada have been using the Differential Aptitude Tests (DAT) as an aptitude test at the secondary stage. The testing time for all the subtests of DAT is 186 minutes. Even when only four subtests (Verbal Reasoning, Numerical Ability, Abstract Reasoning and Space Relations) are used, the time required for administration of these tests is 115 minutes. On the other hand, testing time for another aptitude test, Thurstone's Primary Mental Abilities, is only 74 minutes, which includes 40 minutes for 'Directions'. In an earlier study by the author, the PMA was found to have a high test-retest reliability over a period of four years ($r_{12} = .78$) and to be a good predictor of school achievement.¹ During 1964-65, the Kitchener Waterloo High School Board asked the author to recommend some aptitude test which could save class-time without any loss in predictive effectiveness. Because of the previous experience of the author with the PMA, a comparative study of PMA and DAT was undertaken. It was hoped that, if PMA could serve as well as the DAT, we would save a great deal of class-time of the students and also make more time available to the guidance counsellors for other duties. The Scholastic Aptitude Tests of Ontario (SATO), administered annually to grade twelve students in the general programme in the Ontario schools, were used as an independent criterion for the study. The SATO is adapted from SCAT, one of the most widely used College Admission tests in the U.S.A.. Because SATO are given toward the end of the school programme and are used

to assess the competence rather than the potential of the student, they can be deemed as achievement tests for the purpose of this study. The grade twelve final percentile marks in English and Mathematics were used as a second criterion, although the subjective nature of these marks was recognized as a limiting factor.

Sample and Methodology

The sample consisted of 373 students in Grade XII of whom 189 were boys and 184 girls. During 1964-65, when the data were collected, they were all enrolled in the general programme in the four collegiates in the Kitchener-Waterloo area. Only those Grade XII students in the general courses who were chosen for the SATO study by the Ontario College of Education were included in the study. These students had already taken SATO and three subtests of DAT in the same year (Grade XII). The only test to be administered was the PMA. The data were analyzed at the Ontario Institute of Education during 1965-66. This report is based on the results of a three-way comparison between PMA, DAT and SATO, and the correlations of these tests with the final marks in English and Mathematics.

TABLE I
COEFFICIENTS OF CORRELATIONS (PEARSON'S *r*'s) BETWEEN VARIOUS SCORES ON PMA, DAT AND SATO

	TOTAL GROUP	BOYS	GIRLS
<u>PMA vs DAT</u>			
V:VR	.41	.36	.45
N:NA	.51	.53	.51
R:AR	.35	.38	.30
S:AR	.38	.36	.19
T:(VR + AR + NA)	.54	.60	.50
T:(VR + AR)	.49	.54	.48
T:(VR + NA)	.55	.55	.57
<u>PMA vs SATO</u>			
V:V	.53	.50	.57
N:Math	.64	.61	.63
T:T	.49	.49	.50
<u>DAT vs SATO</u>			
VR:V	.66	.68	.64
NR:Math	.55	.56	.53
T(VR + NA + AR):T	.63	.66	.59

All *r*'s are significantly different from zero at $p \leq .01$.

<u>PMA SUBTESTS</u>	<u>DAT SUBTESTS</u>	<u>SATO SUBTESTS</u>
V = Verbal Meaning	VR = Verbal Reasoning	V = Verbal
N = Number Facility	NA = Numerical Ability	Math = Mathematics
R = Reasoning	AR = Abstract Reasoning	T = (Total Score)
S = Spatial Relations		
T = (Total Score)		

Results and Discussion

The correlation (Pearson's Product-Moment r 's) between various scores on PMA, DAT and SATO for the total group, and for boys and girls separately, are given in Table I.

Although the correlations between total scores on PMA and DAT are between .50 and .60, the correlations between the subtests in these two tests are rather low. Only verbal and numerical subtests in the two tests seem to have some commonalities. The space subtest of PMA appears to be measuring an ability quite different from the abstract reasoning subtest of DAT. The correlations between PMA subtests and SATO subtests are higher than those between PMA subtests and DAT subtests. It appears that the N of PMA and M of SATO are tapping a common ground. It also appears that DAT and SATO correlate a little better than PMA and SATO on the verbal part while PMA and SATO correlate better than DAT and SATO on the numerical part. The DAT total correlates a little better with SATO total than with the PMA total, though the difference is not statistically significant.

The intercorrelations between subtests of each of the three tests are given in Table II.

TABLE II
COEFFICIENTS OF CORRELATION (PEARSON'S r 's) FOR INTERCORRELATION OF SUBTESTS WITHIN EACH OF THREE TESTS—TOTAL GROUP

	V	N	R	S	T	
PMA		.37	.32	.19	.60	V
			.49	.24	.61	N
				.28	.63	R
					.59	S
	VR		NA	AR	T	
DAT			.42	.38	.74	VR
				.39	.67	NA
					.79	AR
	V		M		T	
SATO			.44		.91	V
					.74	M

All r 's are significantly different from zero at $p \leq .01$.

While examining the intercorrelations of subtests within various tests it appears that PMA subtests are based on more independent factors than DAT and SATO subtests. All the inter-subtest correlations of PMA with the exception of the one between R and N are lower than the inter-subtest correlations of DAT and SATO. This is an indication of factorially purer subtests as compared with the other two tests. It is also indicative of the superiority of PMA over the other two tests in tapping different abilities of the students. The SATO total seems to be heavily loaded with the verbal part.

A comparison of the intercorrelations of the PMA subtests in this study with corresponding intercorrelations in a previous study by the author are given in Table III.

TABLE III
COEFFICIENTS OF CORRELATION (PEARSON'S *r*'s) FOR INTERCORRELATION OF PMA SUBTESTS IN THE 1961-62 STUDY AND THE PRESENT STUDY

1961-62 STUDY (139 SUBJECTS)					PRESENT STUDY (373 SUBJECTS)						
	V	N	R	S	T		V	N	R	S	T
V		.29	.58	.35	.64			.37	.32	.19	.60
N			.44	.23	.65				.49	.24	.61
R				.28	.60					.28	.63
S					.45						.59

The correlations of all the subtests with the total are about the same for both studies. Two of the six intercorrelations of the subtests are higher in the 1961-62 study, while three of them are slightly higher in the present study. As PMA's revised version (1962) was used for the present study, the slight differences in the subtest intercorrelations may be caused by the different versions of the test. (The substantial difference [significant at .001 level] in the correlations between R and V might be due to the increased separation between the factors measured by these two subtests.) This provides us with some additional information about the stability of PMA subtests in spite of the recent revision.

The correlations between the Verbal and Numerical subtests of the three tests and the final marks in English and Mathematics are given in Table IV.

TABLE IV
COEFFICIENTS OF CORRELATION (PEARSON'S *r*'s) BETWEEN VERBAL AND NUMERICAL SUBTESTS OF THE THREE TESTS AND FINAL PERCENTILE SCORES IN ENGLISH AND MATHEMATICS

	Tests/School Subjects	English	Math
PMA	Verbal	.33	.17
	Number	.16	.42
DAT	VR	.33	.24
	NA	.24	.39
SATO	V	.42	.27
	M	.25	.50

The correlations of both PMA (V) and DAT (VR) with final scores in English are the same ($r = .33$). The PMA (N) seems to have a little edge over DAT (NA) in its correlation with the final score in Mathematics. SATO (V) and SATO (M) have higher correlations than Verbal and Numerical subtests of PMA and DAT, with final scores in English and Mathematics respectively. This is quite understandable, as SATO

seems to be more of an achievement test than an aptitude test and is expected to correlate higher with final school scores than are the aptitude tests. Correlations in Table IV also support the previous assertion about greater factorial purity of PMA subtests when compared with DAT subtests. Correlations between PMA (V) and the Math. Score and PMA (N) and the English score are lower than the corresponding correlations of DAT and SATO subtests.

Out of the three tests used in the study, PMA is less time-consuming for both students and counsellors. Though the intercorrelations between the total scores on the three tests are not substantially different, the lower inter-subtest correlations of PMA are indicative of its higher factorial purity. While PMA has a certain edge over DAT in its correlation with SATO on the numerical part, DAT is slightly better in the verbal part. There are no significant differences between PMA and DAT subtests in their prediction of final scores in English and Mathematics. Thus, the substitution of DAT by PMA can provide the counsellor with equally valuable information in much less time.

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Rokeach's D-scale was administered to 157 Canadian ninth grade students who had been divided into three achievement categories (Failures, Mediocres and Honours) on the basis of a Provincial academic examination. An inverse correlation between achievement level and "dogmatism" was found. The similarities between these results and the results of another similar study using the F-scale on the same general population were discussed.

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Dogmatism, Authoritarianism and Academic Achievement*

Recently this author published a study in which the scores of Canadian junior high school students on the Adorno F-scale were shown to be inversely related to academic achievement.¹ This result was in line with observations of other experimenters.^{2, 3, 4}

An instrument similar to the F-scale, the D (Dogmatism) scale, was developed by Rokeach.⁵ The D-scale is reported to examine cognitive organization in terms of open vs closed belief systems. A substantial improvement over the F-scale is achieved by Rokeach's test in that it appears not to be affected by the particular political orientation of the testee, as is the case with F. Rokeach documents this claim well. Less well documented, however, is the claim that scores on the D-scale, unlike the F-scale, will not correlate with certain "nuisance" factors such as intelligence or academic ability.⁶ The basis for this claim involves the assumption that the items used on the D-scale are not as "obvious" or "direct". Presumably, this factor will not allow the more intelligent individual to "penetrate" the questions by answering in what is thought to be a more socially acceptable manner, as seems to be the case with the F-scale.⁷

*Appreciation is expressed to Mr. P. A. Boudewyns for his assistance in the preparation of this study.

To investigate this factor Ehrlich⁸ administered the D-scale to 100 sociology students at the same time that they took a "40 item true-false test of sociology knowledge". He found that dogmatism was inversely related to classroom learning, as evidenced by administering the D-scale and a 40 item quiz at a later point. He also found a $-.28$ correlation between the D-scale and an aptitude test. Therefore, Ehrlich's study would not seem to uphold Rokeach's assumption noted above.

The present investigation was part of a larger study which sought to examine the personality and social correlates of failure and honours work in a Canadian junior high school. Along with other tests, the D- and the F-scales were administered to a group of 500 high school students. The purpose of this study was to examine Rokeach's claim by investigating the relationship between D-scores and the academic achievement of junior high school students and noting any similarities between these results and the relationships found between the F-scores and achievement, using the same general population.

Method

Three groups of students were administered the D-scale, along with several other tests* and a personal data form. The three groups were selected on the basis of the marks they received on "The Provincial Departmental Examination". This examination is made up by subject matter specialists and is coordinated and administered by the Provincial Department of Education in this Canadian Province.** The examination includes a standardized verbal and quantitative measure of ability and is administered to all ninth grade students in the Province. The results serve as a major determinant of the academic or vocational pattern the student will subsequently follow.

The aggregate mark each student achieves on the examination is placed on a stanine distribution for the total population of students in the Province who take the battery in any one year. Pre-determined cut-off points denote the categories of Failure, Mediocre ("Pass") and Honours. Approximately the top two stanines are designated as Honours, the bottom two as Failures and the middle five as Mediocres. For the present study all of the Failures and Honours and a sample of the fifth stanine (Mediocres) were selected from the total population of public school boys in a large (270,000) western Canadian city.

The procedure consisted of comparing the scores on the D-scale with the results achieved on the Departmental Examinations. Though a four

* . . . including McClelland's adaptation of the TAT, Sentence Completion, (Rotter) The California Psychological Inventory, Kluckhohn and Strodtbeck's "value orientation" measure, and the IPAT Culture Reduced Intelligence Test.

** Alberta.

hour period was permitted for the student testing, most of the Failure group was unable to complete the scale and some of the other instruments that were readily finished by the Mediocre and Honours groups. This absence of closure for the Failures appeared to be due to their lack of interest and motivation in areas related to academic methods, such as filling out a questionnaire and/or taking a test. Therefore, the scores of the Mediocre and Failure groups were collapsed into one category for purposes of statistical analyses. Ultimately only six Failures, 62 Mediocres and 89 Honours were able to complete the scale in the allotted time.

Results

The resultant difference between the D-scale scores for the Failure-Mediocre group and the Honours group was significant ($t [155] = 3.19$; $p < .01$). Even though the Failure and Mediocre groups had to be combined, the trend for all three groups was linear and the mean for the Failures was the highest of the three. As the level of achievement rises on the Departmental Examinations, the amount of dogmatism declines, as shown in Fig. 1.

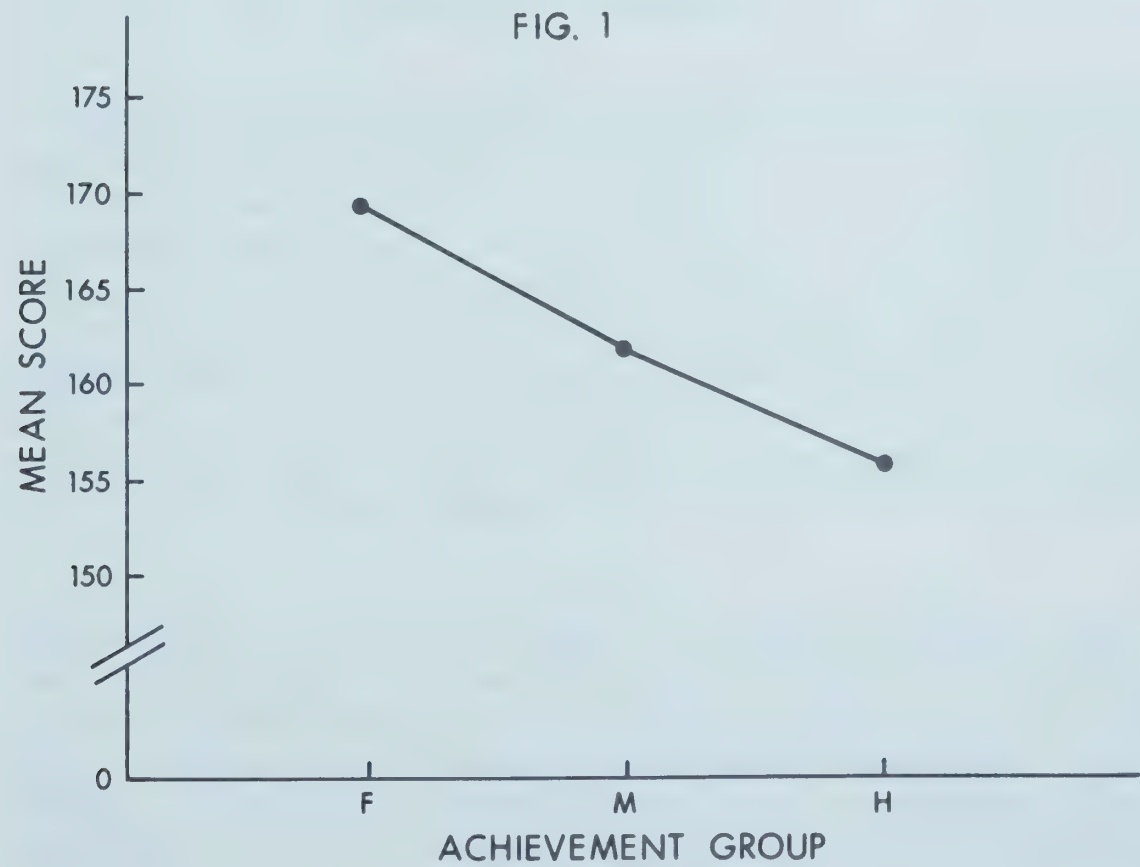
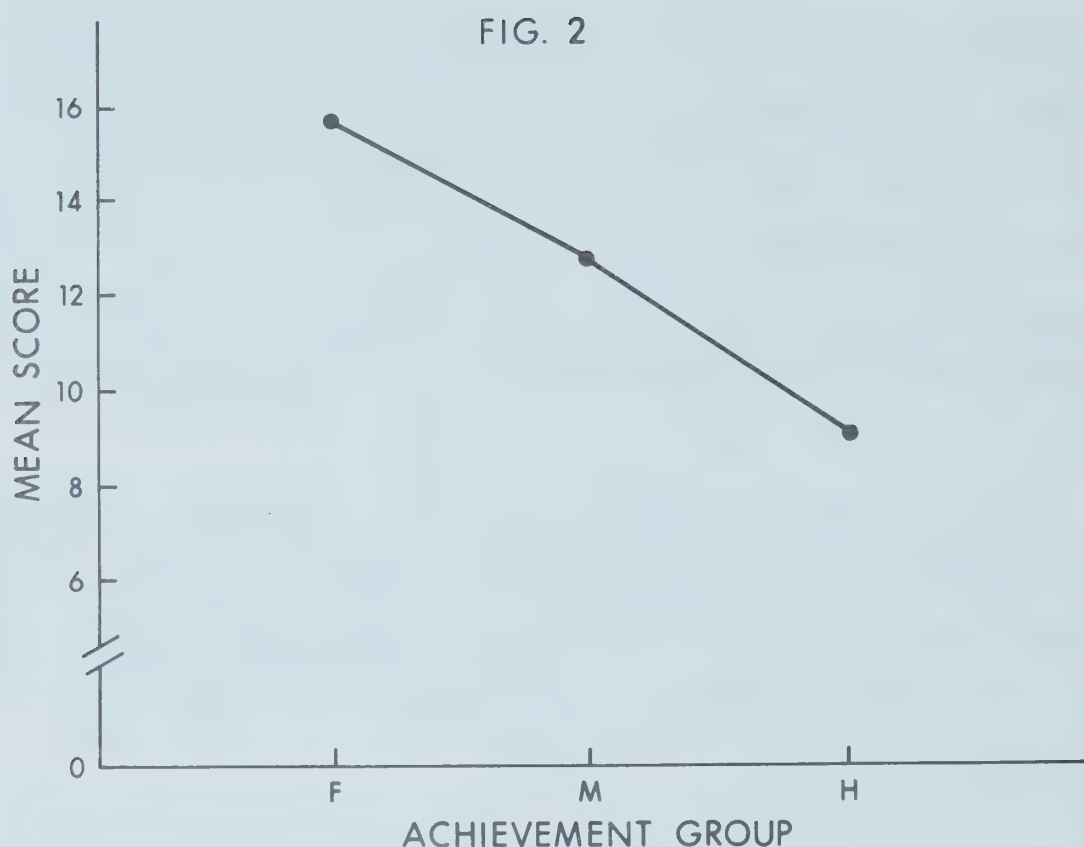


Fig. 2 represents the relationship of the F-scores for the same general population⁹ to the relevant achievement groups. Because of the difficulties involved in obtaining closure on these tests from students in



the lower achievement categories, as mentioned above, no direct correlation was attempted. The observable similarities in the two graphs, however, would seem to demonstrate that academic ability, as defined here, relates to both F and D in a similar manner. The difference between the aggregate F-scores of the combined Failure and Mediocre groups vs the Honours was also significant ($t [182] = 5.87; p < .001$). It was concluded that the results of this study support Ehrlich's earlier findings that Rokeach's scale is not independent of such factors as academic achievement and intelligence. As with the F-scale, the higher achieving subjects did answer in a more socially desirable manner.

Discussion

One explanation of this result would be that the less well-educated and lower-status students are more dogmatic, and that as education and status rise, the amount of dogmatism (and authoritarianism) tends to decline. This is one of the more usual assumptions about education and social class behaviour. Indeed, in the larger study, noted above, a positive relationship between social class, as measured by income, occupation and education, and the achievement level of the student was found.¹⁰

It could also be hypothesized that the relationship between achievement and dogmatism was found in this study because the higher achieving student was able to penetrate the instrument and answer in a more

socially acceptable manner. This study was not comprehensive enough to clearly propose either one of these hypotheses.

Further study with the D-scale, using a design similar to the one presented by Cohen (1952), who varied instructional set to measure "penetration" of the F-scale, would be informative.

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The author presents a review and critique of some issues in leadership research. The paper stresses the importance of system-based concepts of organization, examines the Canadian tradition of leader behaviour research as it relates to organizational behaviour, and suggests some theoretical and design problems to be considered in further research.

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Research on the Behaviour of Educational Leaders: Critique of a Tradition¹

Over the last decade, a number of loosely related studies of the behaviour of educational leaders has been completed in Canadian school systems. These studies are the outgrowth of pioneering work by Hemphill, Stogdill and others,^{2,3} now familiarly and widely known as the Ohio Leadership Studies. Even more familiar is the instrument finally evolved as an operational definition of leadership, The Leader Behaviour Description Questionnaire or LBDQ.⁴

Halpin's refinement of the instrument⁵ and his research using it to describe the leader behaviour of school superintendents⁶ contributed a theoretical framework and empirical tools to educational administrators' longstanding interest in leadership. The fascination of researchers in educational administration with the LBDQ will be commented on later since it is symptomatic of a basic problem apparent in recent research using this instrument. From the Midwest Center at Chicago, LBDQ-based research on the behaviour of educational administrators was taken up by researchers at The University of Alberta and later at other Canadian centres. Much of this Canadian tradition, if we may call ten years of work a tradition, is attributable to the interest and direction of Andrews.⁷

Some Issues in the Study of Leadership

A question frequently asked about leader behaviour is, "How does it relate to individual and group characteristics?" At the present time there are no unequivocal explanations of the relationship between groups and individuals permitting us to claim a satisfactory understanding of leadership phenomena. We do have some agreement about the dimensions of the problem and about the general framework within which the problem may be solved. After a quarter century of research in leadership, it is appropriate to ask where this enquiry has brought us and to refocus upon the underlying issues, namely, the adequacy of theory and research design used in leadership studies.

What is an organization?

The group basis of leadership should cause us to ask what a group is, or, more generally, what an organization is. As educational administrators we are concerned for systems, entities having some formal structure and persisting over time. Theorists like von Bertalanffy and Boulding⁸ point out to the concept of system as fundamental to the scientific view of the universe. The importance of this concept is that it provides a framework for handling the problems of growing, living complexities whether these be biological or social. By seeing the system as a process and as a process moreover which acts *as if* it had some goal or purpose, the system concept suggests a mechanism by which groups imprint patterns of behaviour upon the elements comprising them. Systems or, more concretely, role concepts, have been part of the theory of researchers in administrative behaviour for some time, but their implications have, perhaps, not been fully appreciated. Boulding points these out with his typical forcefulness:

Thus individual electrons come and go in an atom, but once one is captured it must behave in a certain way until it is lost. Similarly atoms come and go in a molecule, but the molecule remains; molecules come and go in a cell, but the cell remains; cells come and go in a body, but the body remains; persons come and go in an organization but the organization remains. What "remains" in the midst of all this flux of components is the "role," the "place," and the relation of roles one to another. A role is a hole, an organization is related and orderly set of holes, and one sometimes catches a fleeting and slightly nightmarish vision of the scientific universe as a set of holes bounded and defined by other holes!⁹

Regarding leadership phenomena as explainable in systems and role theory helps to focus attention of researchers upon the context issues in leader behaviour. The Ohio studies and the LBDQ have from the beginning emphasized behaviour and, particularly, patterns of behaviour. Examining the LBDQ as a research instrument, however, one cannot but be struck by the similarity between items on this "test" and the form and content of items from typical interest inventories and personality scales. For example, the following items:

He is friendly and approachable.
He gets along well with the people above him.
He is working hard for a promotion.
He makes his attitudes clear to the group.
He keeps to himself.

The point here is not that these items cannot refer to behaviour *patterns*, but merely that it is easy when dealing with them to think of them as attributes of the individual which he brings independently to the group and which determine the leadership functions performed within it. To assume, as suggested by Cattell, that a leader may be defined as “a person who has a demonstrable influence upon group syntality”¹⁰ is surely begging the question when our present knowledge does not enable us to state either the direction or the application of such influence.¹¹

This argument suggests that an appropriate framework for the study of leadership must take seriously the organizational context. While making a minimum number of assumptions, adequate theories of leadership should take into account the sources of control in organizations, the dynamics of both internal and external forces which influence the operation of the system. The Ohio studies and the LBDQ itself are built upon descriptions of the kind and frequency of behaviours exhibited by leaders of various groups. The original questionnaire consisted of multiple items defining nine dimensions of leadership as conceived by the original interdisciplinary team of researchers.¹² These items and dimensions were empirically validated by having members of diverse groups describe their leaders in terms of the items. It should be pointed out that these descriptions refer to leader behaviour at a single point in time. Thus while the items may describe behaviour patterns they do so by “photographing” only one point in a process. The items retained in the LBDQ were those differentiating between groups and between dimensions of behaviour. Without questioning the soundness of this technique, it is still necessary to point out that it describes neither changing leadership patterns, the sequence of them, the kind of group in which the patterns were found, nor their relationship to the environment. The position taken in this paper is that questions about dynamics and context are important in the study of leadership. These questions were enunciated some time ago when concerted empirical studies of leadership were begun at Ohio. Since then, however, certain dazzling success with the LBDQ as an instrument to describe leader behaviour has diverted interest from other issues and has allowed assumptions about the individuality of leadership to gain tacit acceptance.

As a reaction to this trend in leadership research, this paper suggests that it is time to re-examine our theories of leadership and to direct attention to some untouched areas of investigation based upon new strategies of enquiry. In particular, it is suggested that research look at

organizational leadership as one of many social phenomena that are shaped by a variety of interpersonal, structural and technical constraints.

Some Dimensions of Organizational Behaviour

From the many issues open to investigation, social psychologists have extracted the individual-group relationship in organizations as the area of prime interest. It is useful then at this point to ask how far small group theorists have taken this investigation and with what results. A recent summary of findings is not encouraging. On the basis of work by Bales, Cartwright, Zander, Homans and others, a recent review article concludes that "there are few occasions when variables at the individual process level are treated as the independent and those at the group level are treated as the dependent."¹³ Commenting on this statement and underlining the difficulty of making meaningful statements about group-individual relationships, Yamamoto concludes as follows:

But, are such effects at all meaningful when the two indices are measuring two facets of the underlying phenomenon at two different levels? It appears rather difficult to establish any simple relationship between the tensile strength of an alloy and the mean value of the molecular weight of the component metals. How then are we to make sense out of the covariation, if any, among the heterogeneous measures of the individual-group-institutional system variables?¹⁴

This question underlies many group phenomena in education including leadership, authority, and the teaching-learning act itself.

Reference to theorists such as Morris and Seeman,¹⁵ Stogdill,¹⁶ Petrullo and Bass,¹⁷ and Zaleznik and Moment¹⁸ suggests that organizations can best be conceived as multi-faceted systems—systems processing inputs from an environment and yielding outcomes which may modify the organization itself, its components, or the environment in which it exists. Most explicitly and recently Miles¹⁹ has provided a systems model for organizations which relates their functioning not only to leadership, but to such other important group characteristics as morale, communication, change, and adaptation. In building a systems model describing an organization, a useful and perhaps necessary starting point defines four component categories bound together by theoretical connections and to some extent by empirical findings. Without further elaboration on these notions, the categories may be identified as input, social structure, social process and output.

Relationships Among the System Components

Systems are more than a collection of components. The essential properties of a system are the relationships existing between components or between subsystems of components. This condition holds with equal strength for organizations. When we ask, as does much research in leadership, how the characteristics of an individual modify the processes of a

group, we single out for attention only one of the many possible relationships holding among organizational variables. What these relationships are and, more particularly, what causal connections exist within the systems are matters on which research findings are all too scarce.

It would be convenient if some causal chain of relationships held in organizations where social products were a result of inputs from the environment, social process were a result of social structure and where outputs, stemming from process, were fed back again to the environment. In reality organizational relationships are not likely to be either linear or simple; the relationships observed may work in a reverse direction. Some outputs may be determined directly by technology with social process and structure being largely irrelevant to this relationship. Or an observed effect in one subsystem may appear concomitantly with that in another. With a high degree of probability, we may predict conditioning or mediating relationships between the variables. Thus given a particular social structure and process, a technological innovation may produce one effect upon output, though with other social conditions its effects might be different.^{20,21}

Research in Leader Behaviour

The Ohio State Leadership Studies, begun in 1945, approached the topic of leadership by "examining and measuring performance or behavior rather than human traits".²² Because they had little help from previous theory and research, and for other reasons documented elsewhere,^{23,24} the Ohio researchers began with a minimum number of assumptions about leadership. Focusing upon how leaders operate, the approach was from the beginning essentially psychometric. Multitudes of items relating to nine supposed dimensions of leader behaviour were contributed by an interdisciplinary team of social scientists. From that point onwards the development of the LBDQ was essentially a process of simplification. The original 1,790 items and nine dimensions were reduced to obtain a comparatively brief, easily administered questionnaire which would provide scales characterizing the behaviour of the leader in a given group while distinguishing it on the same dimension from the behaviour of leaders in other groups. The final coup in this process of reduction was administered by Halpin and Winer²⁵ who factor analyzed previous forms of the questionnaire to produce the thirty item form composed of the well-known dimensions, Consideration and Initiating Structure.

It is significant that Stogdill, who had been an early worker in the Ohio Studies, later produced an expanded and multidimensional LBDQ-Form XII, claiming, "It has not seemed reasonable to believe that two factors are sufficient to account for all the observable variance in leader behavior."²⁶ Although use of the Halpin and Winer LBDQ is frequent in education, it is being replaced by the LBDQ-XII through

Stogdill's own extensive use of it²⁷ and its increasing applications in education.^{28,29,30}

The production of the LBDQ stimulated considerable research on the behaviour of educational leaders with the best known being that of Halpin.³¹ Support for these studies came from research and theory of small group behaviour. In this field, structural-functionalist theory was supplanting the situationist approach. The latter approach viewed groups and the leader behaviour required in them as varying in a multitude of situational factors including goals, structure, individual needs and attitudes. The former position held that regardless of the specific group-functions a leader performs, there are basic functions common to all groups and therefore to all leaders. Thus, the LBDQ's purely empirical dimensions of Consideration and Initiating Structure could be interpreted as the leader's efforts to fulfill the group's basic needs for Group Maintenance and Goal Achievement.³² With this empirical success and theoretical strength behind it, the Canadian tradition of leadership research blossomed by finding various applications of the LBDQ, and later the LBDQ-XII, in school settings.³³

In reporting this research, the model of an organization as a system will serve to classify the relationships studied. The four-fold model of the organizational system yields ten types of relationships if categories of variables are related two at a time. Thus, a social process variable such as leader behaviour may be related to another social process variable, possibly group characteristics, as measured by Hemphill's Group Dimensions Description Questionnaire.³⁴ In addition, it could be related to variables in any of the other three categories—inputs, social structure or outputs. The types of relationships possible are indicated in Table I. Multivariate relationships among the variables would greatly increase the number of analyses possible.

TABLE I
TYPES OF RELATIONSHIPS AMONG CATEGORIES OF ORGANIZATIONAL VARIABLES

	Input Variables	Social Structure Variables	Social Process Variables	Output Variables
Input	I/I	I/SS	I/SP	I/O
Social Structure		SS/SS	SS/SP	SS/O
Social Process			SP/SP	SP/O
Output				O/O

The most frequent type of relationship investigated is that between social process and output variables. Specifically, these relationships deal with the consequences of leader behaviour for various measures of output. This emphasis reveals a concern for the outcomes of organizational process that is consistent with common organizational zeal to maximize goal

accomplishment. It is significant, too, that only four of the ten types of relationships have been considered and that multivariate procedures have been used only in a minority of studies. The consequence of this lack of multivariate analysis will be commented upon later. It is sufficient now to say that the emphasis upon leader behaviour-outcome relationship leaves other possible relationships relatively unexplored, particularly the conditioning or mediating kinds of relationships which can be discerned only through multivariate analysis.

Leader Behaviour and Other Social Process Variables

Four studies relate leader behaviour to other social process variables. At the same time that the LBDQ was being developed at Ohio State University, Hemphill³⁵ developed the Group Dimensions Description Questionnaire (GDDQ) which yields a profile of members' perceptions of group characteristics. The thirteen dimensions included in the questionnaire have been shown by Hemphill to differentiate among teaching groups and a variety of other groups as well. The instrument describes such characteristics as the autonomy, flexibility, hedonic tone, stability and stratification of the groups.

Morris³⁶ demonstrated that five of the GDDQ dimensions were related to effective principal leader behaviour when effective behaviour is defined as leadership which is jointly and highly considerate and structured. Under these conditions, effective leader behaviour was positively related to participation, polarization and potency in the group; negatively to flexibility and stability. Thus under effective leader behaviour, the teaching groups were found to be characterized by members who gave much time and effort to group activities (participation), who were oriented to goals clear and specific to members (polarization), and for whom the group itself had primary significance (potency). At the same time groups with effective leadership were characterized by members who followed established rather than informal procedures (flexibility), and who felt that the characteristics of the group itself had failed to persist over time (stability). Reverse relationships held among teaching groups where the principals' leadership was described as ineffective. These findings suggest that in activating a group towards clear goals and in building a group that is significant in the eyes of its members, the effective leader lays down firm behaviour expectations and shifts the basic social characteristics of the group.

Thompson³⁷ investigated the degree to which subordinate supervisory personnel held conflicting expectations for the leader behaviour of superintendents. As with earlier research³⁸ the subordinates expected more Consideration and Structure than they perceived themselves as receiving from their superintendents. There was also more agreement about the expected leader behaviour than about the perceived, indicating that how-

ever much individuals may agree on the style of leader behaviour they desire to see, they are less agreed about what they *do* see in leaders. Similarly, the subordinates were more agreed about Consideration expected than Structure expected. Thus one of the problems for leaders is meeting the variety of expectations held for their behaviour by subordinates, particularly in the area of the initiation of structure.

Two studies of leader behaviour as social process have examined the structure of the research instrument itself.^{39,40} Stogdill's claim that two factors, Consideration and Structure, are insufficient to account for all the observable variance in leader behaviour,⁴¹ led him to construct the multi-dimensional LBDQ-XII. The validity of this claim can be tested in part through factor analysis of the instrument. Stogdill earlier observed the high intercorrelations between the sub-scale scores of the LBDQ-XII and performed factor analyses of leader behaviour data obtained in different types of organizations. The results indicated that the LBDQ is indeed reducible to a smaller number of factors, but that the factors emerging depend upon the organization in which the instrument is used.⁴² Conflicting evidence is reported on this score by Brown⁴³ and Punch.⁴⁴ This conflict may in part be due to the different approach taken by these investigators. Whereas Stogdill factored the LBDQ-XII data from each organization separately and obtained different factors from each organization (even apparently similar organizations), Brown and Punch factored the data from all schools and then determined how leader behaviour in each school varied in terms of factors identified. Because of the instability of factors based upon small N's, the latter approach seems to be psychometrically more sound.

The factors identified in the work of Brown and Punch are given in Table II. In each of these studies, Factor I composed heavily of Initiating

TABLE II
FACTORS IDENTIFIED IN TWO STUDIES USING THE LBDQ-FORM XII

LBDQ-XII Dimensions	Brown (1967)		Punch (1967)	
	Factor I	Factor II	Factor I	Factor II
Representation	.78 ^a		.64	
Demand Reconciliation	.51	.73	.69	.38
Tolerance of Uncertainty		.86		.68
Persuasiveness	.73	.42	.79	
Initiating Structure	.89		.86	
Tolerance of Freedom		.85		.91
Role Assumption	.77	.41	.85	
Consideration		.86	.37	.79
Production Emphasis	.87		.80	— .39
Predictive Accuracy	.62	.63	.81	.34
Integration	.62	.68	.71	.52
Superior Orientation	.57	.50	.55	
Eigenvalue	4.72	4.21	5.21	2.75
% total variation	40%	36%	43%	23%

^aLoadings smaller than $\pm .30$ have been omitted.

Structure, Production Emphasis and Role Assumption—has been named System Orientation, while Factor II—composed heavily of Consideration, Tolerance of Freedom and Tolerance of Uncertainty—has been named Person Orientation. These two factors bear a significant resemblance to Halpin and Winer's Initiating Structure and Consideration factors in the original LBDQ.

It is not likely that this factoring brings us back to the original dimensions of the LBDQ, since the sub-scales of the LBDQ-XII have intrinsic merit in themselves⁴⁵ and help to define the two factors more precisely. At the same time, the methodology of Punch opens the possibility of using determinate factor scores which are psychometrically and practically more valid and useful than the raw sub-scale scores.

Leader Behaviour and Output Variables

The earliest of the studies reviewed here is that by McBeath.⁴⁶ This study examined the relationship between the leader behaviour of teachers and their teaching effectiveness as rated by themselves, other teachers in the school, their principals, superintendents and pupils. The study found that rated effectiveness related strongly to teachers' leader behaviour as described by the various judges. The striking exception to this finding occurred when the teachers' descriptions of their own leader behaviour and effectiveness were related. In this case, self-descriptions of leader behaviour and effectiveness had little or no relationship to each other. Feedback to the individual about his own performance was apparently minimal. To the extent that others' ratings of teachers' leader behaviour represent social reality, these findings help to define global ratings of teacher effectiveness, in terms of leader behaviour.

The possibility of halo effects contaminating both leader behaviour and effectiveness ratings is clearly apparent in studies like McBeath's. Halo in the LBDQ was early recognized by its developers,⁴⁷ and although McBeath attempted to avoid compounding the effect, it seems likely that both his leadership and effectiveness ratings lie in the same dimension, thus explaining the high relationship between them.

Two studies following McBeath used indices of teacher and school effectiveness which are clearly independent of leader behaviour ratings. Keeler⁴⁸ devised an index of school effectiveness based upon pupil achievement and aptitude as measured by a set of external examinations and the Cooperative School and College Ability Tests (SCAT). Using a standardized score representing the difference between actual and predicted pupil achievement, Keeler approximated a measure of pupil growth attributable to the effectiveness of the school in instruction.

With this criterion, Keeler examined the relationships between principal leader behaviour, teacher morale and pupil growth. Both principal leader behaviour and teacher morale were related to pupil growth, though,

contrary to the hypothesis, teacher morale did not act as a mediating variable between principal leadership and pupil growth. Stogdill also failed to establish this hypothesized chain of effect. His contention, based on his own and other research, is "that the executive can more easily influence the cohesiveness and morale than the productivity of the unit that he supervises."⁴⁹ Morale and productivity may both be outputs of social process and structure, but any relationship they may have with leader behaviour is likely complex and non-linear.

In Keeler's work, the strength of the relationship between principal leader behaviour and output was considerably weaker than that reported by McBeath between teacher leader behaviour and rated teacher effectiveness. This difference confirms that halo may well have operated in the earlier study and possibly that rated effectiveness might better be regarded as a social process than as an output variable. Another significant finding reported by Keeler indicated a stronger relationship between pupil growth and principal's goal-oriented behaviour than between pupil growth and idiographic behaviour.

Keeler's findings were in part confirmed by Greenfield and Andrews⁵⁰ who examined the relationship between teacher leader behaviour and pupil achievement. Instead of the rated effectiveness criterion used by McBeath, they used an index of pupil growth similar to Keeler's. As with McBeath the relationship between teacher leader behaviour and effectiveness was confirmed, though the use of the growth measure reduced the closeness of the relationship considerably. In line with Keeler's findings, too, Greenfield and Andrews reported stronger relationships between growth and structured behaviour than between growth and considerate leader behaviour. They concluded that some twenty per cent of variance in pupil growth was predictable from leader behaviour with most of this (nearly 18%) being due to structure in the teacher's behaviour.

Leader Behaviour and Other Output Variables

Another dimension of output was examined in the work of Miklos.^{51,52} Specifically, his study examined the relationship between principal leader behaviour on the one hand and leader ambivalence, group consensus and agreement on the other. Leader ambivalence was defined as the intensity with which the leader holds role expectations for himself; consensus referred to the homogeneity of opinion within the teaching group about the principal's role; agreement referred to the similarity of role expectations between the principal and his staff as a group. Scales defining role expectations were built around Seeman's conceptualization of the leadership role.⁵³ Contrary to the hypotheses, the leader behaviour dimensions were not consistently related in either linear or curvilinear analysis to the ambivalence, agreement or consensus variables.

Only through multivariate analysis did meaningful relationships emerge between the leader behaviour and the conflict variables defined by Miklos. As might be expected on the basis of system conceptions of organizational behaviour, this finding indicates that many relationships between apparently adjacent and interacting variables are mediated and conditioned by other variables less obviously related to the first pair. For example, Miklos reported that relationships between structure and ambivalence in schools where teachers manifest high consensus were significantly different from those in schools where they manifest low consensus. That is, where teachers were unsure or in disagreement about the principal's role, it was appropriate for the principal to be ambivalent about structure in his leader behaviour. But where consensus existed among teachers about the principal's role his ambivalence about structure was inappropriate. Similarly, agreement between teachers and principals was more likely when principals were described as high in both structure and consideration. Though this finding was not firmly established, it is important even in a tentative form since it questions whether a principal is at the mercy of teachers' expectations or whether "he can in a very real way influence their expectations and bring them close to his self-expectations."⁵⁴

Another finding from the Miklos study bears on this same issue. When tenure of teachers and principals was considered in connection with the structure-consensus relationship, it became clear that this variable mediated the effects of the other two variables. Miklos explained the relationship as follows:

The longer that principals who are high in structure associate with a particular group of teachers, the more consensus there is within the group of teachers on role expectations for the principal. This does not hold if the principal is low in structure for then the amount of consensus decreases as the length of association increases.³⁵

Miklos also reported a similar relationship between tenure, structure and agreement. With structured behaviour on the part of the principal, the agreement between him and teachers increased. Without structure, such agreement apparently decreased over time.

Satisfaction and Confidence as Output Variables

A study by Fast⁵⁶ examined the relationship between teacher satisfaction and principal leader behaviour. This study demonstrated that teacher satisfaction was related to the degree of leader behaviour perceived by teachers. Moreover, the greater the discrepancy between leader behaviour expected and perceived, the lower the satisfaction. Expectations of leader behaviour as a single variable had no relationship to teacher satisfaction. It was apparent, too, that consideration perceived was more strongly related to satisfaction than was structure perceived. Furthermore, social and personal relationships among teachers or between

teachers and principals were less important sources of satisfaction than was the professional stimulation which teachers gained from each other and from the principal.

The most recent research relating teacher satisfaction and leadership made use of the LBDQ-XII as an instrument for describing principals' behaviour. Using factor scores derived from the factored LBDQ-XII, Anderson and Brown⁵⁷ related principals' leader behaviour to teacher satisfaction, confidence in leadership and ratings of school effectiveness. Most strongly related was leader behaviour and confidence in leadership. While teacher satisfaction showed a similar strong relationship with principal leader behaviour, teachers' ratings of school effectiveness bore no relationship to the principal's leader behaviour. This finding bears out Stogdill's position that group satisfaction and morale as outputs of an organization are not necessarily instruments of productivity. These studies also argue for the desirability of both structure and consideration in leader behaviour, "so long as strength in one form is not cancelled out by a disproportionately poor showing on the other."⁵⁸

The study by Punch⁵⁹ investigated the relationship between leader behaviour and social structure in schools. Schools were divided into those where principals' leadership strongly influenced social structure and those where influence was weak. In strong-relationship schools, principals rated their own influence and teacher satisfaction higher than those in weak-relationship schools. Teachers in strong-relationship schools also regarded their principals as more effective than those in weak-relationship schools. School effectiveness ratings bore no relationship to these organizational conditions in schools.

Leader Behaviour and Organizational Climate

A study by Schmidt^{60,61} examined the relationship between the LBDQ-XII and Halpin and Croft's Organizational Climate Description Questionnaire (OCDQ).⁶² Strikingly, the correlations between these two instruments were rather small. Very few correlations rose above .50 with the highest being .73 between the Production Emphasis scales on the two instruments. In terms of the factors recently identified in the LBDQ-XII,^{63,64} the Production Emphasis and Thrust scales of the OCDQ resemble the System Orientation factor while the Esprit dimension resembles the Person Orientation factor. The scales of Consideration, Hindrance, Intimacy and Aloofness on the OCDQ bear virtually no relationship to scales or factors in the LBDQ-XII, suggesting that the factorial structure of the OCDQ is still indeterminate despite contrary claims by its authors.

Leader Behaviour and Input Variables

Comparatively few studies have related input variables; most which have done so have investigated the relationship only as a sub-problem

of the research. Thus, Thompson⁶⁵ reported that more highly qualified subordinates expected more structure in their superintendent's behaviour than did less qualified subordinates. More striking findings were brought out by Punch⁶⁶ who reported that although schools varied significantly as to their principals' leader behaviour, similar differences were not found between districts. In light of Charters' criticism of the LBDQ,⁶⁷ this finding is important in that it indicates the LBDQ-XII is independent of system effects. Punch also reported that school size is unrelated to leader behaviour. Another study of the relationships of a variety of input variables with leadership was made by A. F. Brown.⁶⁸ He concluded that none of eight factors such as school bus schedules, density of population and condition of the school building, either together or in combination, significantly affected leadership.

The input variables analyzed in this way included size and type of school, tenure, sex, age and experience of staff and socio-economic status of the school community. These findings give confidence that many of the variables which affect leader behaviour lie within the organization and are not input to the system arbitrarily from the environment. In multivariate analyses some input variables are significant when social structure and leader behaviour are considered jointly. These will be considered below under social structure-process relationships.

Leadership Training as an Input Variable

The only study reported here that considered the effect of leadership training upon leader behaviour is that by Blocksidge.⁶⁹ It is also the only study reported which used an experimental design. Twenty-two principals who attended a two-week course in instructional and administrative "leadership" were compared with twenty-two like principals who did not attend the course. Both groups were described as leaders before the course and again after it. Although the course did not give leadership training *per se* and although the leader behaviour descriptions were made in two different academic years after the usual summer break in school terms, significant differences in the behaviour of the two groups were noted. Superintendents and teachers who described the principals' leader behaviour reported an increase in considerate behaviour for the group attending the course. Conversely, the attending principals saw themselves as having less consideration after the course than before it. Thus, the apparent effect of the course was to increase the amount of the principals' considerate behaviour and to give the principals' insights into their own behaviour which caused them to evaluate it less positively. This study suggests other experimental designs for much needed research on changes in leader behaviour over time as other organizational variables are manipulated.

Leader Behaviour and Social Structure Relationships

Some findings about leader behaviour-structure relationships are provided by Thompson⁷⁰ and, more significantly, by Punch.⁷¹ Thompson reported that both expectations and perceptions of superintendents' leadership varied by district, though no such variation was found between various groups of subordinates. Thus, different expectations of superintendents' leader behaviour grew up within districts, but not between groups within a given district.

Punch reported findings which make strong inferences about leadership-social structure relationships. Using the Organizational Inventory⁷² as a measure of school bureaucratization, Punch found that 57% of variance in school bureaucratization was accounted for by leader behaviour, and offered evidence through multivariate analysis that bureaucratization was dependent upon leader behaviour. In this regard, system-oriented behaviours of principals were positively related ($r = .37$) to bureaucratization in their schools and person-oriented behaviours of these leaders were strongly and negatively related ($r = -.66$) to school bureaucratization.

In schools where principal and teachers had been together for some time, Punch found stronger relationships between leader behaviour and bureaucratization than in schools where togetherness was of shorter duration. Similarly, the relationship between leadership and bureaucratization tended to be stronger when teachers had come to the schools with relatively little experience. Thus, principals seemed able to shape social structure by their leader behaviour when teachers came to a school relatively naive about the social structure and process of schools and stayed in a given school for a long time. It is in this way that schools grow as organizations—as social systems.

Surprisingly, school and system size correlated negatively with bureaucratization. Seventy-five per cent of variance in social structure was accounted for by the most potent variables—system size, school size, togetherness of principal and teachers and, the one most powerful variable, leadership.

A Critique of Theory and Research in Leadership

Examination of leader behaviour studies such as those reviewed above suggest that the time is ripe for researchers to consider a number of critical issues. Greater attention to these issues may mean that research might begin to examine and illuminate some basic leadership problems that have been set aside while other more feasible and pressing problems were being pursued. In conclusion, this paper will consider: (1) the present state of LBDQ-based research, (2) some problems of leadership and group theory, (3) applications of leadership theory, and, (4) research design related to the study of leadership.

The State of Leader Behaviour Research

In reviewing leader behaviour research such as that presented in this paper, the basic similarity of approach in most of them may well strike the reader. While the technical complexity of the analyses and the virtuosity of researchers' statistical skills increase over time, the approach most frequently used relates one variable to another in a rather simplistic fashion. The dependence of these studies upon correlation and factor analytic approaches seldom establishes causal links between variables. By implication, however, the weight of the reported relationships and the repetition of them inevitably suggests determining and mediating effects that are unwarranted by the research design.

These studies have helped to establish a construct validity for the LBDQ in school settings, at least in the two major versions used. The validity was established in terms of a number of other organizational variables, notably output variables of one kind or another. Relationships with other social process variables and with social structure and environmental inputs were also explored. In this regard, however, it is apparent that the emphasis upon leadership-output relationships is perhaps disproportionate. In part this emphasis has served to shift attention from system concepts of organization. Relatively little attention has been focused upon technological influences on organization and upon leader behaviour within it.⁷³ Similarly, authority relationships between the leader and the environment of his group have received little attention. As Zaleznik and Moment⁷⁴ comment, the leader is not "alone" with his group but must interact with higher level leaders whose influence may sometimes be decisive in determining the lower leader's behaviour. We cannot assume that leader behaviour in schools is analogous to leader behaviour in experimental or voluntary small groups or in primary groups.⁷⁵

The research conducted in most of the studies reviewed here may be identified as a variety of "experimental" or "explanatory" survey.⁷⁶ This method usually relies upon *ex post facto* manipulation of variables observed at Time 2 to infer causal effects from Time 1. The usefulness of this technique should not be a continuing reason for using it alone when other designs can help to formulate hypotheses that allow the researcher to make "strong inferences" about the direction of observed relationships.⁷⁷

Attention should be drawn, too, to the criterion problem in leadership research. The studies reported here, as already noted, tend to select a rather narrow range of criteria or dependent variables. As Morris and Seeman⁷⁸ pointed out some time ago, any organizational variable may become the criterion for the operation of any other. Attention to the problem of how such criteria may best be selected is clearly called

for. The question of new designs for leadership research will be considered in the final section of this paper.

Theory Problems in Group Leadership

The fundamental problem in leadership research may well be the lack of adequate theory or at least the lack of attention to theory. It might be recalled at this point that the Ohio Leadership Studies began virtually without theory, necessarily making a minimum of assumptions about the phenomena studied. Later, theoretical formulations from various sources in organization theory, small group theory and role theory^{7,9,10} were used to provide a framework or model for the phenomena described by the LBDQ. It is well to recall that the developers of the LBDQ saw as one of its prime virtues that it provided quick, easy description of the leader behaviour in groups.⁵¹ The instrument merely describes patterns of behaviours exhibited by leaders at a particular point in time. It is easy now after so many studies based on the LBDQ to confuse such descriptions with theoretical formulations about the nature of leadership. Even the claim that the LBDQ describes patterns of behaviour might be stated more carefully since it is apparent that the descriptions are usually taken at a single point in time, thus providing data that are scarcely adequate to describe complex behaviour processes within an organization. The danger we must now beware is the possibility that researchers may enshrine a single instrument as an adequate model of group process.

Clearly, more dynamic statements about leadership processes are needed than are implied in the LBDQ alone. As a beginning Homans' conceptions of leadership⁵² may serve an important purpose. Unlike LBDQ-bound statements about leadership, Homans' concepts emphasize the process and the system; he characterizes the leader as the person in the group moving it from one steady state to another. His "rules" about leadership deal with active leading, with role maintenance, with authority, obedience and channels of communication. Thus, Homans' conceptions of the leadership function contrast rather sharply with the psychologically and psychometrically oriented items of the LBDQ. As Gouldner suggests, evidence of the traits approach to leadership in LBDQ-based research may be inevitable, "peering through the cracks" of an apparently system oriented approach.

Other useful approaches are suggested in the work of organizational analysts such as Likert,⁵³ Kahn and Katz,⁵⁴ and Zaleznik and Moment,⁵⁵ where leadership is examined in terms of the general supervisory relationship and other variables often not considered in typical LBDQ-based research. Recent work by McNamara and Enns⁵⁶ moves in this direction by examining school leaders in terms of theory and variables developed by Fiedler.

Leadership is clearly a phenomenon of social groups of many kinds. Studies of leadership in education-oriented groups cannot usefully progress in isolation from studies in other kinds of groups. Stogdill's contention that leader behaviour factors are a function of the particular group clearly conflicts with factor analysis of leader behaviour in school groups. This issue, already identified in this paper, offers an opportunity to examine the source of conflict and to develop research whose findings could have important implications for building leadership theory.

More theoretical problems lie in the basic concepts of group that have been used in leadership research. The relationship between individual properties and group properties is still unclear. Underlying this problem is the question of what variables adequately express the syntality of the group rather than merely the average value of heterogeneous individual characteristics.⁸⁷ It is apparent that the LBDQ sums and averages individual perceptions and judgements, thus raising the problem of halo and the difficulty of relating phenomena at one level to those at another. Yamamoto's analysis of this problem has already been referred to.⁸⁸ Since this is the same problem now receiving attention in research on teacher-pupil interaction,⁸⁹ work in this field might profitably be related to studies in leadership.

The question of what a "group" is in a large school offering a highly diversified curriculum to hundreds or thousands of pupils is a question leader behaviour researchers in education have largely avoided. One means of avoiding it has been to study only relatively small schools, usually at the elementary grade level. It is now time that this question was attacked more directly in view of its theoretical and practical importance. Finally, in the area of theoretical problems, one might mention the question of how leaders exert influence in schools and what mechanisms and resources are involved in this process.⁹⁰ Zaleznik and Moment⁹¹ mention the process of group reality testing as an important aspect of leadership processes. Incorporation of these and other novel variables in research on educational leaders is surely now desirable and possible.

Applications of Leadership Research

Applications of the findings of research in leadership to educational practice have been relatively few in number. Unlike the practice in industry,⁹² education has not used the LBDQ as an instrument for controlled attempts to train leader behaviours. This area of research clearly warrants development as this line of investigation has yielded important findings from its use in business settings.⁹³ Indeed, the LBDQ has been used in leadership clinics for school administrators⁹⁴ and has provided important data for research; these clinics have also given practitioners insights into leadership theory and feedback about their own leader

behaviour that would otherwise be inaccessible to them. Other more extensive clinical applications and research are needed. Explaining leadership theory to a principal and describing his behaviour by way of the LBDQ is roughly equivalent to explaining theories of intelligence or personality to a client before having him complete the Stanford-Binet or the MMPI. Without help from his therapist, what can the client do with his scores from such tests? And what can a leader do about his "scores" on the LBDQ or other similar "tests"? Clearly, giving the test is only the beginning of clinical procedures. Theories of leadership are not theories of leading any more than theories of learning are theories of teaching. In studies of leadership we are only beginning to understand the nature of the phenomenon. How this knowledge can be used to improve leader behaviour and organizational performance has largely still to be discovered.

Research Design for Leadership Studies

The final issue to be raised here concerns research designs appropriate for the study of leader behaviour in organizations. The primary need in leadership research is to create designs which will permit the study of process. The LBDQ is designed to slice through an organization and describe conditions at a fixed point in time. This procedure does not give much information about process. At least, repeated observations using the LBDQ in the same organization are required. Laboratory groups and participant observer techniques could also be used to advantage in connection with leadership research. To date, very few studies in educational leadership have used such procedures.

Initiated structure and manifest consideration have been the data collected for most leader behaviour studies. Questions about the establishment of structure or the development of consideration have not been and cannot be answered in current research designs. What is needed is an understanding of the dynamics of group process. We need to know, for example, how changes in interaction, amount of structure or goal definition affect the attitudes, cohesion and productivity of teaching groups. Evidence about such matters has been obtained from experimentally contrived small groups. However, such studies have not usually attempted to simulate teaching groups, and virtually no studies have examined this kind of problem in teaching groups actually functioning in schools.

Stogdill describes group processes and leadership as observed in experimentally contrived groups:

. . . tension and conflict are involved in the development of structure in experimentally created groups given the task of discussing a social problem and preparing a written solution. Initially, the members exhibit a high degree of task-oriented performance, but this preoccupation with the task decreases in later sessions. Comparatively small amounts of disagreement

and tension are exhibited in the first session, but these show a sharp increase in the second session and thereafter decline. Agreement declines sharply from an initial high level, but this is compensated for by an equally sharp rise in solidarity and tension release.⁹⁵

Statements of this kind cannot be made on the basis of current research on the behaviour of school leaders. The reason for this is largely due to the one-shot designs used in leader behaviour research, in which process can be described only in unidimensional terms. Reliance upon LBDQ data collected from a single encounter with a group can clearly not provide adequate descriptions of leader behaviour and its relationships with group structure and process.

The general deficiency in leadership studies has been a lack of research designs that give information about group process changes over time. Classical controlled experimentation is not impossible in studies of leadership. Though the ease and convenience of *ex post facto* studies is readily acknowledged, we cannot overlook their very large weaknesses.⁹⁶ Greater attention, too, should be given to questions of methodology in explanatory surveys that are undertaken. In this regard, the techniques of multivariate analysis should be more generally applied as this concept is understood by Lazarsfeld.⁹⁷ The emphasis here is upon multivariate analysis in a structural sense where relationships between variables are examined and compared under different organizational settings or conditions. Statistical multivariate procedures are clearly relevant also, but are not identical. They give no assurance that partial or multiple correlations separate distinct types or groups of organizations so that varying organizational relationships may be compared within and between them. Similar attention should be given to wider problems of methodology and survey design.^{98,99}

Conclusion

It is hoped that this review and critique will focus attention upon some issues in leadership research so that, while profiting from past research, investigators may consider issues often neglected or postponed as a result of the bloom of LBDQ-based research and psychometric survey designs. The paper stresses the importance of system-based concepts of organization, demonstrates how a Canadian tradition of leader behaviour research has illumined some relationships in organizational behaviour, and suggests some theoretical and design problems to be considered in further research.

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BOOK REVIEWS

SCHOOLS OF THE FOOTHILLS PROVINCE: THE STORY OF PUBLIC EDUCATION IN ALBERTA

*By: John W. Chalmers, Published for The Alberta Teachers' Association,
(Toronto: University of Toronto Press, 1967).*

This, the first history of Alberta's public school system, is the contribution of The Alberta Teachers' Association (ATA) to Canada's centenary celebrations. With the publication in 1964 of a similar history for British Columbia by F. H. Johnson, half of the public school story for western Canada has been told.

Unlike Johnson, Chalmers uses both the chronological and topical approaches, as did C. B. Phillips in his pioneer history of Canadian education a decade ago. Thus Part I divides the last one hundred years into ten periods (giving each a chapter), from the establishment of the first schools in the west in the early nineteenth century to the report of Alberta's royal commission on education in 1959. It is by far the most interesting part of the book. Part II, the curriculum section, traces the chronological development of several topics: high schools, vocational education, examinations and promotions, correspondence schools, special education, and Indian education. Part III, the administration section, does the same for centralization, bus transportation, teacherages, separate schools (Catholic and Hutterite), and educational finance. Part IV discusses the politics of education, reviewing, in turn, the evolution of the superintendency, the Alberta School Trustees' Association (ASTA), the Faculty of Education, and the ATA itself. An excellent index concludes the work, but there is no bibliography, although footnotes noting sources are frequent.

There is no doubt that the work is an invaluable contribution to the sparse literature on the development of education in western Canada. The ATA is certainly to be commended for having subsidized such a comprehensive study of the development of public education in Alberta. It will be a ready reference for many aspects of the subject in the province.

The work, however, is not without its serious weaknesses. Although presented as a "story", it is on the whole a dull story; and however much it may please the professional, it will not have a wide appeal. This is unfortunate for the intention, as shown in the choice of terminology ("story" rather than "history"), was undoubtedly otherwise. One cannot fault the style, for the book is well-written. It may be tedious but it is not difficult to read. The work suffers, however, because it is primarily

the story of institutional growth—the growth of the public school system rather than public education, which, as Bernard Bailyn (*Education in the Forming of American Society*, 1960) has made clear, is a much wider term.

In the institutional approach personalities are unimportant, or are at least of minor significance, and events take place as if men did not exist. Instead of correspondence (private or official) and diaries or memoirs (where these exist), or even newspaper editorials and letters to the editor, the main sources of information in the institutional approach are the colorless and tiresome official government publications, committee reports, and university theses. Yet in the work under review the story would be much brightened if men such as Perren Baker, H. C. Newland, J. W. Barnett, G. P. Smith, T. O. King, G. F. McNally, and Wm. Aberhart—all prominent in the story—were delineated as people rather than presented as incidental ciphers in the course of Alberta's educational development. In new regions such as Alberta contemporary histories are probably inevitable, but their blandness (to protect the living) might be partially overcome by consulting the same living about the philosophies, aspirations, and motivations of the late dead. This is particularly important where the few sources of important correspondence that are known to exist (the files of the ATA, the ASTA, the Faculty of Education) have apparently not been consulted.

There is perhaps another reason why the work is not as interesting as the author's well-known wit and not inconsiderable talents as a writer would lead one to expect. The work pays little attention to the feelings, hopes, and thoughts of the people who settled Alberta. Thus the people came in the main from Ontario, the British Isles, the United States, and central and eastern Europe, yet there is no treatment of the ever-present problem of Canadianization and the resulting interplay of Ontario, British, and American influences on the work of the schools. The Ontario heritage with its WASP overtones is largely overlooked, as is the impact of such mid-west phenomena as populism, religious fundamentalism, progressivism, and the neo-conservative reaction of recent years. It is doubtful whether educational history will ever amount to much until it becomes a handmaiden of social history—until it takes the ideals of the people and the motivations of their leaders in the establishment of institutions into account. The work under review fails in this respect. It fails to see education in its "elaborate, intricate involvements with the rest of society" and to relate these to education's "shifting functions, meanings and purposes" (Bailyn, *op. cit.*, p. 14). As a result, the first cultural history of education has still to be written in Canada.

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LEARNING TO READ: THE GREAT DEBATE

By: Jeanne Chall, (New York: McGraw-Hill Book Company, 1967).

Sponsored by the Carnegie Corporation, Dr. Chall initiated in 1962 and completed by 1965 a critical analysis of existing research "comparing different approaches to beginning reading". Her general objective was to examine current innovations and determine whether ". . . these changes . . . [are] justified by existing evidence or by the results of current experimentation". More specifically, she hoped that the study would also ". . . salvage whatever we already knew, . . . help point up specific gaps in our knowledge . . . and help future experimenters design more crucial, meaningful studies".

Publications by Nila B. Smith (1934, 1960), Fries (1963) and Barton and Wilder (1964), as well as by others equally eminent in their respective fields, had already gained professional acceptance for the conclusion that the vast, fragmented accumulation of reading research is inadequate as a foundation for future research. Chall's 371 page discussion of the "rather dismal picture" which she says research in reading presents, would have to be considered a redundancy unless it had something to offer that would take it beyond the writings of these others. When, in addition, one stops to consider the fact that practice in the field already incorporates many of the "innovations" which Chall suggests to improve materials, methods and research, one might also be tempted to conclude that, from the point of view of reading research, this book was obsolete before it was published.

Dr. Chall explains, however, that *Learning to Read* is a revision of her study, and that it appears in its present form to make it "useful to educators and understandable to laymen". It is, therefore, from this point of view that the book must initially be evaluated.

What has it to offer "educators" (inclusive as such a term may be)?

The book does present a sequential description of the historic controversy over method that seems to have become chronically associated with the teaching of beginning reading. As might be expected from the co-author of one of the most respected formulas for predicting readability (Dale-Chall), the book, despite being closely packed with detail, is clearly written. It is free of professional jargon, it has been prepared with great care and professional integrity and its documentation is excellent. Terminology is carefully defined. Included are italicized pre and post summaries for each section in the form of questions which lead to more questions and summaries at the conclusion of each major topic, as well as generalizations drawn, as possible hypotheses for future research, at the end of each major section.

The presentation of the pros and cons of the debate is done with great subtlety: partisan discussion has been predicted and anticipated by the provision of answers, in the body of the text, to almost any question or argument that might be advanced. The frequent use of tentative state-

ments is deceptively persuasive in leading the biased reader to withhold judgment. This sophisticated technique would seem to be both necessary and effective in the discussion of controversial issues, because as Chall says:

Since neither the issue nor the evidence was clear-cut, I describe, whenever possible, the process of reasoning I went through to arrive at my interpretations.

The book also provides criteria and schedules by which an educator can evaluate research, innovations, basal readers and other materials, lessons, activities or classroom procedures generally. This section, particularly, is excellent.

The author's conclusions about innovation and change and the pressures which result in the implementation of or resistance to these processes, from the educator's viewpoint, are also discussed at some length. As a result the educator is, perhaps, enabled to see himself in perspective, in the context of his professional relationships with school, parents, community, textbook publishers and teacher training institutions. He can also gain insight into his failings and possible failings as an innovator and interpreter of reading research. Thus, in addition to the valuable analysis and "essencing" of past research, the author has provided a reference that is enhanced by the inclusion of current laboratory studies as well as the most recent large scale projects on beginning reading.

The educator, therefore, will find this book of great value, and in this area the author can be considered to have been eminently successful in fulfilling her stated objectives.

What of her intentions regarding the layman?

While lacking a professional orientation toward the question, the layman, too, could perhaps garner considerable information from the author's presentation. The description of innovations, the comparison between British and American teacher attitudes to children or theory, and the discussion of basal readers is topical and pertinent. One might, however, wish to be assured that the layman to whom this material is made so freely available would be able to assess, interpret and use it as objectively as one relies on a professional to do. The fact that he is expected to benefit from the "understandable" italicized summaries at the beginning and end of each chapter does not in any way deter him from misinterpreting or supporting from the reported research biases which hitherto had rested on opinion alone. The advisability of directing professional publications of this nature co-jointly to such widely disparate audiences can therefore be seriously questioned.

Reading Dr. Chall's book was an interesting and enjoyable experience and yet it resulted in an aftermath of disquietude. Reading specialists are still analyzing their field "parochially" rather than conceptually! Despite the fact that she realizes that:

. . . more research may engender more confusion if it is not synthesized and put into a meaningful framework . . .

and that

. . . when new reading programmes are adopted they should be cast in a research and development framework . . .

Chall herself fails to go beyond conventional limits. She does succeed in consolidating under two major headings ("Code Emphasis" and "Meaning Emphasis") the splinter groups which constitute the ranks of methodological theoreticians. Had she, herself, with her background of experience, knowledge and professional status, however, seen fit to develop a conceptual framework for analyzing and synthesizing her data, rather than restricting herself to the usual methodological terminology, *Learning to Read* might have been a major contribution to educational literature.

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THE PSYCHOLOGY OF LANGUAGE, THOUGHT, AND INSTRUCTION

By: John P. De Cecco, (New York: Holt, Rinehart and Winston, Inc., 1967).

The editor of this excellent book of readings has been successful in drawing together articles, representing a wide variety of related disciplines, which will further the general objective—greater knowledge and understanding of instruction in language and thought.

Chapter 1 deals with the interdisciplinary field of psycholinguistics: a consideration of the communicator as he encodes and decodes messages. Here transformational grammar is included because Chomsky's descriptions are based on the psychological processes which generate sentences. Other grammars are supposedly not included because these are *after the fact* descriptions of language products—products which might, nevertheless, communicate the results of linguistic and cognitive activity. While not arguing with the editor's rationale in this case, it seems likely that other descriptions of language, such as that of the structural linguist, could have been used to suggest that children at an early age are capable of using language which must have been accompanied by higher mental processes.

In Chapter 2 the editor has assembled a theoretical base for a consideration of the way in which language systems control thought. Such a consideration of linguistic relativity might have been strengthened by the inclusion of some of the available research evidence in this area and by linking it to Chapter 3, the relation of language and thought to social class differences. It would seem likely, in this regard, that some of the

careful investigations of the language of the culturally disadvantaged would support the somewhat less secure claims of the linguistic relativists. At this point the reader must sympathize with the editor: so little is available to provide the synthesis he tried for.

Chapters 4, 6, 7, and 9 represent psychology. These deal with the nature of meaning in language and with ways in which meaning at the conceptual and propositional levels is acquired. This section forms the solid core of the book. De Cecco has chosen his readings carefully to represent fairly both the cognitive and behaviourist schools of psychology. He has, perhaps, done all that might be done at this point in time to present an overview of the psychology of language.

Chapter 5 is one of the two chapters dealing with instruction and is the first real disappointment in the book. The editor might certainly be excused for choosing reading for consideration with its extensive research and theoretical literature. It is, however, difficult to justify a view of reading that includes little but word calling and this in a book with a psychological emphasis. Perhaps the real error in judgement was in not putting reading in its proper place within the language arts. A consideration of the encoding which might reasonably accompany the reading act would also have ensured the inclusion of higher mental processes and, in spite of the definition of reading used, provided a more worthy example of instruction in language and thought.

The second chapter dealing with instruction, Chapter 10, lacks something, too, in the satisfaction it provides the reader, but here the editor is not to be faulted. The authors themselves have searched for ways of providing instruction in language and thought and, while their attempts are often exciting, the reader is left with the feeling that there is a long way to go both in building instructional models in this area and in verifying them.

This is an interesting and a useful book. It is much more than a collection of readings which, on the whole, are well selected. The editor's excellent introductions to each of the chapters provide a theoretical framework for the chapter itself and for the book. Such was the inadequacy of the literature available for the editor's consideration in the case of some of the chapters, however, that a reader might often wish for even more in the way of a synthesis, pointing wherever possible to next steps in theory and research.

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GREEK ETHICS

By: Pamela Huby, (London: Macmillan & Co. Ltd., 1967).

ETHICAL INTUITIONISM

By: W. D. Hudson, (London: Macmillan & Co. Ltd., 1967).

CONTEMPORARY MORAL PHILOSOPHY

By: G. J. Warnock, (London: Macmillan & Co. Ltd., 1967).

EXISTENTIALIST ETHICS

By: Mary Warnock, (London: Macmillan & Co. Ltd., 1967).

These four books are the first to appear in a new series, *New Studies in Ethics*, edited by W. D. Hudson. The series as a whole is intended to "meet the need for a comprehensive survey of ethics from the point of view of contemporary analytical philosophy" (editor's preface to the first book). On the evidence of these four books, the series promises to be an interesting and important one, both from the point of view of the professional student of philosophy and the interested layman. I am unclear as to the purpose of the editor's emphasis on "contemporary analytical philosophy" as the point of reference. It is true that the contributors to the series are all well-known philosophers associated with that tradition, and thus the categories employed tend not to be those of German or French philosophy. However, I find the books reviewed mostly free of ideological axe-grinding, and written in language that requires no particular familiarity with technical philosophy. I propose to take each book individually and then make some general comments on them as a group.

Mrs. Huby offers us a survey of Greek ethical thought from the beginnings through to the Stoics, the last Greek school of philosophy. She treads very skillfully the narrow ridge between unwieldy scholarship and unhelpful popularizing: the more esoteric material is relegated to footnotes at the end of the book. Certain points which are crucial to the understanding of Greek ethics are made very clearly, and the resulting picture is faithful to the documentary evidence without being enslaved by it. She makes five divisions, pre-Socratic thought, Socrates, Plato, Aristotle and post-Aristotelian, and in this is reflected perhaps the one item where she shows impatience with the rigours of scholarship. The chapter on Socrates contains many overt speculations as to the extent and content of his philosophy; while the ideas she attributes to him are interesting and valuable, the evidence for them I find too scanty. The evidence suggests Socrates was important for his method rather than for the content of his philosophizing; Mrs. Huby tries to give him both.

In dealing with earlier Greek thought, she emphasizes well the role of history in its development. Greek morality puts a high value on

results not motives as being of ultimate moral significance, and on individual happiness as the end of life. These are notions abhorrent to people brainwashed by the nobility of suffering and "It matters not who won or lost, but how you played the game". This leads as much to unfair and hysterical evaluations of them as immoral as it does to Nietzschean trumpet-calls for the return to the healthy ideas of our Greek forefathers. The truth is that the appearance of this value-scheme at that stage of Greek history was as determined by the nature of their society, as ours is to a large extent by our society. Physical survival of Greek communities for a number of decades was not possible except under that scheme of values, and comparisons made in ignorance of the fact, whether favourable or unfavourable, are inappropriate.

Plato is well presented as inspired by but yet surpassing Socrates, and as challenging the accepted morality in a fundamental way. Mrs. Huby accuses him of too much internalizing virtue, of assuming without proof that, if intentions and motives are right, right acts will follow (p. 31). Plato does claim this, but he offers a justification, namely that Virtue is Knowledge and Knowledge is absolute and infallible. Against this metaphysical background, the internalizing of virtue is not in itself illegitimate. However, the metaphysical background is unacceptable, and from this it follows that the internalizing is unacceptable.

In two places, the relevance of the Greeks to contemporary moral theory is brought out. Mrs. Huby spends sometime on the *Philebus*, the last real dialogue Plato wrote. It is a philosophical analysis of pleasure which is worthy of consideration by anyone interested in Hedonism, and is well presented in this book. Aristotle also deals with some of the issues being presently debated, whether and, if so, how there is an essence of goodness, the importance of the particular situation in ethical decision-making, the logic of responsibility, the relation between thought and action and, again, pleasure as an ethical value. Not only does Aristotle debate these issues, he also, as Mrs. Huby indicates (p. 44), debates them in a manner analogous to that of many contemporary philosophers, the manner epitomized by John Austin's remark that "ordinary language is *not* the *last* word. It is the *first* word" (*Philosophical Papers*, p. 133).

W. D. Hudson's book is, I think, the best of the four. By "Intuitionists" he does not mean the 20th century group led by Moore and Ross, but the group of 18th century British philosophers consciously reacting to Hobbes, namely Shaftesbury, Hutcheson, Cudworth and the rest. Hudson is content to let these men speak for themselves, and by careful arrangements of their thoughts, he is able to make this tactic totally successful. For what is remarkable about this group of philosophers is their apprehension of the strengths and weaknesses of their own position. While they tend to agree on the strengths, they attempt to meet the weaknesses in different ways. Although, as Hudson says in his concluding assessment of the picture thus far presented, there are funda-

mental objections to any form of Intuitionism, the liveliness of this private debate among a group sharing common presuppositions is quite fascinating, and shows that Intuitionism need not necessarily be the kind of sterile philosophy it is often thought that it must be.

The central point at issue here is one that is central in Plato and Aristotle too, namely the relation of thought and action. How can an intuition, which is primarily cognitive, issue in moral action, which is primarily a matter of will and not just reason? Many argued that the apprehension of the end to be sought moved the will, whether this apprehension was a matter of the senses or of the reason. None of them was prepared to accept the suggestion that many contemporary theorists put forward, that the will determines the reason. Butler compromised by making Conscience combine the roles of reason and will. However, there is the obvious objection here, and I cannot see that Hudson makes it in so many words, that this theory simply defines away the problem in a manner no one will find satisfactory.

Hudson also makes a point with respect to these philosophers analogous to one made by Mrs. Huby about the Greeks, that their views are a product of their social context. He points out that they were writing at a time when there was "a high degree of unanimity in the deliverances of conscience" (p. 61). Thus the empirical facts seemed to support an Intuitionist theory, in the same way as the empirical facts of morality do not now. We are now, for various reasons which are not relevant here, aware in a way we were not two hundred years ago of the differences in moral beliefs of different people and different ages. This is widely held to form the same sort of support for a subjectivist, whether personal or social, account of morality as the unanimity was held to form for Intuitionism. What needs to be emphasized here, and Hudson does not mention it, is that either opinion is confused. The thesis that moral knowledge is a matter of the intuition of objective values, or of the subjective creation of values are philosophical and so *a priori* theses. Facts about agreement or disagreement among men with respect to moral matters are as irrelevant to the truth of such theses as *any* facts to the truth of *any a priori* thesis.

The question of the sterility of Intuitionism will serve as a bridge to Mr. Warnock's book, for it is here that Moore *et al.* are mentioned. I will not say "discussed", for Warnock proves to his own mind the sterility of this brand of Intuitionism by spending little time on its propounders. It is true that a poorly articulated defence of Intuitionism will be sterile, but Warnock is too ready, to my mind, to find in Moore and Ross such poor articulation. It is also true that Intuitionism is easy to ridicule: few instructors in ethics, and the present writer is not one of them, have failed so to play to the gallery. But what is easy to ridicule is not necessarily ridiculous. Warnock seems emotionally committed to denigrating this movement, remarking quite gratuitously that "Ross deviates in the direction of good sense" (p. 11), and that Moore

is guilty of "a rather unpleasing and even arrogant self-assurance" (p. 5); I find Warnock manifestly guilty of this fault himself. He culpably misrepresents Moore at one point, in approving of Ross' view that an object's value is supervenient on its other properties (one of Ross' putative "deviations") and implying Moore was too stupid to see this point in his time. That is just false. Moore goes into the whole issue in some detail in his paper "The Conception of Intrinsic Value", published in 1922, some eight years before Ross' views appeared in print; this hardly justifies attributing this improvement on Moore's original doctrine to Ross alone. In short, the fact that contemporary moral philosophy in the analytic tradition began with Moore, and that he had and still has an enormous influence, are both represented by Warnock as being entirely regrettable, and this is a gross injustice to a man who said what he said because he could see no other defensible alternative. What Moore says at times seems odd, but it is his shrewd understanding of his subject-matter which led him to say it that is his real contribution, and this Warnock effectively ignores.

Other movements and figures get similar short shrift. Emotivism is summarily dismissed, and once again Warnock erroneously implies that C. L. Stevenson is quite unaware of certain criticisms of his theory, e.g., that on p. 27 about some uses of moral language being not in fact emotional. In *Ethics and Language* this and other of Warnock's points are anticipated and dealt with by Stevenson. Hare's prescriptivism is given a longer run, but the objections are old hat, and many moral philosophers have got beyond dealing with Hare at that level. There are also some surprising omissions. The book is supposed to "provide a compendious survey of moral philosophy written in English since about the beginning of this century" (p. 1), and yet there is no mention either of Dewey's Instrumentalist theory, or of the cultural and individual subjectivism of Westermarck and Perry. It is true that these thinkers have not had much influence in Britain, but they had and still have a great deal of influence in North America. Perhaps Warnock does not think English is spoken in North America. Toulmin, who, like Hare, sought to build on Intuitionism and Emotivism, is barely mentioned; yet he followed a different and in many respects more interesting path than did Hare from the same starting point.

The discussion of these three viewpoints occupies slightly more than half the book. For the remainder we are treated to Warnock's opinions on what contemporary moral philosophy ought to have concerned itself with, rather than what it did concern itself with. What there is of significance in the book is in this part, even though it is, as Warnock concedes, somewhat disorganized. He makes some helpful remarks (Chap. VI) on the opposition to Naturalism, which corrects some misunderstandings about that debate. Overall, however, this seems to me the least satisfactory volume of the series. An extended sympathetic report on the tradition would have achieved at least as much as War-

nock's unsympathetic cursory review and his own gospel, would stand much less risk of alienating readers, and would be more in keeping with the purpose of the series.

Mrs. Warnock attempts to be quite fair in her account of Existentialist ethics; she does not conceal her fundamental disagreement with the type of philosophizing she is discussing, but neither patronizes them as sincere but naive, nor inveighs against them as malicious and disruptive. She acknowledges the enormous difficulty in presenting a brief account of any Existentialist thought; its deliberate method tends to be unsystematic and to emphasize the individuality of entities and contexts. Any summary must necessarily ignore this, and lose much of what is valuable. However, as Mrs. Warnock rightly maintains, there are some basic presuppositions in Existentialist ethical theory, and she sets herself to isolating these together with a few examples of these presuppositions at work in particular cases.

Two main themes are traced out; firstly, the connection between ethics and the rest of philosophy in their thought, and secondly the ramifications of the claimed uniqueness of every moral situation. Clearly there is a close connection between their ethics and their general philosophy: the uniqueness of the individual is such that in all respects *the world is his world*. Mrs. Warnock sees the connection as flowing from general philosophy to ethics—"All philosophy leads ultimately to an answer to the ethical question" (p. 53). There is one slight danger in bringing out this point, which is to forget that the general epistemological basis from which Existentialist thought derives is significant in its own right, not merely because of the ethics to which it leads, and, for Kierkegaard and Heidegger at least, is seen as significant and leading to conclusions in non-ethical fields of enquiry.

Mrs. Warnock spotlights unerringly the difficulties I find with Existentialist ethics. What is emphasized is the solitude of the individual, the uniqueness of each decision that individual is called to make; the result is that little can be done in the way of specifying the content of morality except to say, Be authentic, Be yourself. This, she says (p. 54-55) involves making solely the act of moral choice ethically significant, without regard for what is chosen. This is absurd, for "if choosing freely for oneself is the highest value, the free choice to wear red socks is as valuable as the free choice to murder one's father" (p. 54). The second difficulty is closely related to the first. From the same viewpoint is derived the thesis of absolute responsibility—we are always responsible for our choices, no matter what the context of our choices. This is, interestingly enough, a thesis found in Aristotle, though arrived at from a somewhat different angle. This is also absurd, obliterating distinctions that need to be made. To glory in the absurd does not diminish its absurdity.

The one single thing that emerges most powerfully from these four books, dealing as they do with theorists of widely different ages and

contexts, is how much even so are there common concerns and common viewpoints. There is a ready explanation for this: ethical philosophy is an enquiry whose area is man and not his world, man as having dimensions to his nature not to be captured in impersonal mechanical laws. The progress of science and technology, the supplanting of old knowledge by new, are in this respect different, and both types of enquiry should, for their mutual benefit, not seek to concern themselves with the other's business. If we are still chewing the same things over as did Plato and Aristotle, this might imply that we should give philosophy up. To agree with that view would be to make the mistake I have just outlined, to assume erroneously that there is something wrong if we have not moved on to other problems. Philosophical problems, in whatever field, education included, do not go away, and progress in philosophy is not a matter of making them go away. It is a matter of understanding those problems and why they have on us the perennial grip they do have. In one area of philosophy, this new series looks like teaching that lesson well.

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